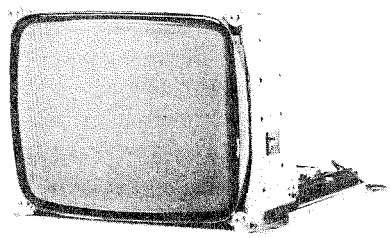
Service Manual

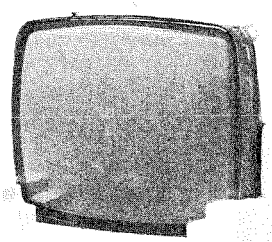
CRT Data Display

MODEL M-900 XXX Series
Chassis No. Y08A
Chassis Family No. 9Y08
MODEL M-1200 XXX Series
Chassis No. Y08
Chassis Family No. 12 Y08

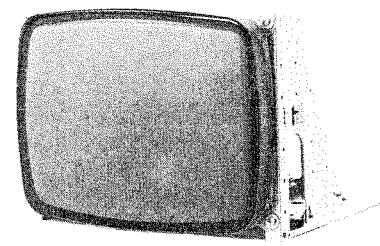


Model
M-9004NA, M9009NA
M-9001NA, M-9009A
Direct Drive Input

Model
M-C9004N, M-C9001N
Compsite Video Input



Model
M-K12004NB, M-K12001NB
Direct Drive Input Kit Type



Model
M-12004NB
Direct Drive Input

Model
M-C12004N, M-C12001N
M-C12009N
Compsite Video Input

Model
M-12021PB, M-12021NB
M-12041NB
H.OSC Internal Type

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Panasonic

Matsushita Electric

SAFETY PRECAUTIONS

1-1 CAUTION:

No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guide lines.

1-2 SAFETY CHECK

Care should be taken while servicing this CRT display because of the high voltage used in the deflection circuits. These voltages are exposed in such areas as the associated flyback and yoke circuits.

1-3 FIRE & SHOCK HAZARD

1-3-1 Insert an isolation transformer between the CRT display and AC power line before servicing chassis.

1-3-2 In servicing pay attention to original lead dress especially in the high voltage circuit. If a short circuit is found, replace all parts which have been overheated.

1-3-3 All the protective devices must be reinstalled per original design.

1-3-4 Soldering must be inspected possible for cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all foreign material.

1-4 LEAKAGE CURRENT COLD CHECK (AC power supply model only)

1-4-1 Unplug the AC cord and connect a jumper between the two prongs on the plug.

1-4-2 Turn the CRT display power switch on.

1-4-3 Measure the resistance value with an ohmmeter between the jumpered AC plug and each exposed metallic part on the CRT display such as metal frame, screwhead, control shafts, etc.
When the exposed metallic part has a return path to the chassis, the reading should be 1.8 megohm minimum.

1-5 LEAKAGE CURRENT HOT CHECK (AC power supply model only)

1-5-1 Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during this check.

1-5-2 Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15μF capacitor between each exposed metallic part and good earth ground (as shown in Fig. 1).

1-5-3 Use an AC voltmeter with 1000 ohm/volt or more sensitivity and measure the AC voltage across the combination 1500 ohm resistor and 0.15μF capacitor.

1-5-4 Move the resistor connection to each exposed metallic part and measure the voltage.

1-5-5 Reverse the polarity of the AC plug in the AC outlet and repeat the above measurement.

1-5-6 Voltage measured must not exceed 7.5 volt RMS, from any exposed metallic part to ground. A leakage current tester may be used in the above hot check, in which case any current measured must not exceed 5.0 milliamp. In the case of a measurement exceeding the 5.0 milliamp value, a rework is required to eliminate the chance of a shock hazard.

Note: High voltage is present when this CRT display is operating. Always discharge the anode of the picture tube to the display monitor chassis to prevent shock hazard.

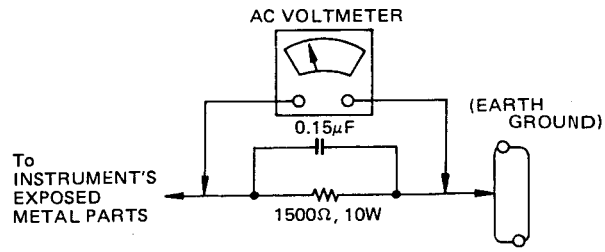


Fig. 1

1-6 IMPLOSION PROTECTION

All Panasonic picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage and scratching during installation. Use only Panasonic replacement picture tubes.

1-7 X-RADIATION

WARNING: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level.

Note: It is important to use an accurate periodically calibrated high voltage meter.

1-7-1 To measure the high voltage, use a high impedance high voltage meter.
Connect (-) to chassis and (+) to the CRT anode button.

1-7-2 Turn the Brightness control fully counterclockwise.

1-7-3 Measure the high voltagg. The high voltage meter should indicate at the following factory-recommended level.

1-7-4 If the upper meter indication exceeds the maximum level, immediate service is required to prevent the possiblity of premature component failure.

1-7-5 To prevent X-Radiation possibility, it is essential to use the specified picture tube.

1-7-6 The following are the nominal and maximum high voltage at zero beam current at rated voltage.

Model	Nominal	Maximum
M-900xxx	11kV	14.5kV
M-1200xxx	14kV	17.0kV

IMPORTANT SAFETY NOTICE

There are special components used in Panasonic CRT displays which are important for safety. These parts are shaded on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacture's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without written permission of the Panasonic company or this will void the original parts and labor guarantee.

GENERAL INFORMATIONS

This manual contains information of the standard model designed as a data display monitor for M-900xxx Series and M-1200xxx Series.

When connecting to equipment, directly connect it to printed circuit board input terminal through 10-pin card edge connector.

In addition, +B is supplied from the outside through 10-pin card edge connector, operating the monitor on +12V DC.

External brightness VR (Custmer Supply) is used by connecting it to the connector.

Features:
CRT is exceptionally superb in quality and reliability and is of non-glare type (direct etched CRT) and polish Type phospher.

The deflecting coil is a yoke equipped with 4-P magnet and is of PANASONIC's own design that permits adjustment of geometric distortion on the raster,

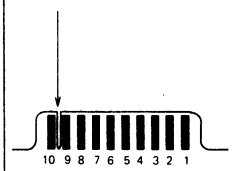
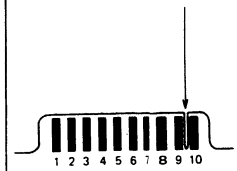
In order to meet users' requirements, frame mechanism is employed for easy adjustment of CRT setting angle.

Angle can be changed by stages such as 0°, 2.5°, 5°, 7.5° and 10°.

Chassis is fully equipped with ICs:
- Vertical deflection
- H.P.C. (horizontalphase control)
- H.AFC/OSC

F.B.T is sealed up for assuring high quality and reliability.

All connections are equipped with connectors to make servicing easier.

TYPE	A Type	B Type
Edge Connector	Key way slot  (Foil side)	Key way slot  (Foil side)
P.C.B. No.	TNP81896	TNP81894

MODEL NO.	Construction and Input Connector Type	Input Signal Type	CRT Phosper
M-9001NA	Flame A	Separate	P31 Green Nonglare
M-9004NA	Flame A	Separate	P4 White Nonglare
M-9009NA	Flame A	Separate	P39 Yellowish-Green Nonglare
M-9009A	Flame A	Separate	P39 Yellowish-Green Polish
M-C9001N	Flame A	Compsite	P31 Green Nonglare
M-C9004N	Flame A	Compsite	P4 White Nonglare
M-12004NB	Flame B	Separate	P4 White Nonglare
M-12021NB	Flame B	Separate	P31 Green Nonglare
M-12021PB	Flame B	Separate	P31 Green Polish
M-12041NB	Flame B	Separate	P31 Green Nonglare
M-C12001N	Flame B	Compsite	P31 Green Nonglare
M-C12004N	Flame B	Compsite	P4 White Nonglare
M-C12009N	Flame B	Compsite	P39 Yellowish-Green Nonglare
M-K12001NB	Kit B	Separate	P31 Green Nonglare
M-K12004NB	Kit B	Separate	P4 White Nonglare

CRT DATA DISPLAY SPECIFICATIONS

SEPARATE TYPE MODEL

ELECTRICAL CHARACTERISTICS

	9" M-9001NA M-9004NA M-9009NA M-9009A	12" M-12004NB M-12021PB M-12021NB M-K12001NB M-K12004NB	12" M-12041NB
Power Requirements:	DC12V 1.0A max.	DC12V 1.3A max.	DC12V 1.4A max.
Signal Input:			
Video Input Signal	Black level = 0 +0.4V −0.0V White level = 4 ±1.5V	Black level = 0 +0.4V −0.0V White level = 4 ±1.5V	Black level = 0 +0.4V −0.0V White level = 4 ±1.5V
Input Impedance	300 ohms min. 40pF max.	300 ohms min. 40pF max.	300 ohms min. 40pF max.
Vertical Input Sync Signal:			
Active Polarity	Positive	Positive	Positive
Pulse Rate	60.0Hz	60.0Hz	60.0Hz
Amplitude	Low = 0 +0.4V −0.0V High = 4 ±1.5V	Low = 0 +0.4V −0.0V High = 4 ±1.5V	Low = 0 +0.4V −0.0V High = 4 ±1.5V
Input Impedance	1K ohm min. 40pF max.	1K ohm min. 40pF max.	1K ohms min. 40pF max.
Horizontal Input Sync Signal:			
Actice Polarity	Positive	Positive	Positive
Pulse Rate	15.75KHz	15.75KHz	18.96KHz ±0.5KHz
Amplitude	Low = 0 +0.4V −0.0V High = 4 ±1.5V	Low = 0 +0.4V −0.0V High = 4 ±1.5V	Low = 0 +0.4V −0.0V High = 4 ±1.5V
Input Impedance	2K Ohms min. 40pF max.	2K ohms min. 40pF max.	2K ohms min. 40pF max.
Video Amplifier Bandwidth:	25MHz typ	25MHz typ	25MHz typ
Rise/Fall Time	15ns/15ns typ	15ns/15ns typ	15ns/15ns typ
Resolution:	800 TV lines typ (CRT Center)	1000 TV lines typ	1000 TV lines typ (CRT Center)
Character Area:			
Vertical	4.33 ±0.2" (110 ±5mm)	5.91 ±0.2" (150 ±5mm)	5.91 ±0.2" (150 ±5mm)
Horizontal	6.30 ±0.2" (160 ±5mm)	8.46 ±0.2" (215 ±5mm)	8.46 ±0.2" (215 ±5mm)
Blanking Time:			
Vertical	1000μs min.	1000μs min.	840μs min.
Horizontal	10μs min.	10μs min.	10μs min.
Deflection Linearity:			
Vertical/Horizontal	10% max.	10% max.	10% max.
Geometric Distortion:			
Vertical/Horizontal	Within 1.5% measured with standard EIA ball chart	Within 1.5% measured with standard EIA ball chart	Within 1.5% measured with standard EIA ball chart
Operating Ambient Temperature:	0 ~ 55°C	0 ~ 55°C	0 ~ 55°C
Storage Temperature:	−40 ~ +65°C	−40 ~ +65°C	−40 ~ +65°C
Operating Humidity:	5 ~ 90% (Non-Condensing)	5 ~ 90% (Non-Condensing)	5 ~ 90% (Non-Condensing)
Operating Altitude:	0 ~ 10,000 Feet (3,000m)	0 ~ 10,000 Feet (3,000m)	0 ~ 10,000 Feet (3,000m)
Storage Altitude:	0 ~ 40,000 Feet (12,000m)	0 ~ 40,000 Feet (12,000m)	0 ~ 40,000 Feet (12,000m)

PHYSICAL CHARACTERISTICS

Dimension:			
Height	6.84" (174mm)	8.98" (228mm)	8.99"(228.3mm)
Width	9.49" (241mm)	11.46" (291mm)	11.47" (291.4mm)
Depth	8.90" (226mm)	11.62" (295mm) * Not application are Kit Types	10.84" (274.4mm)
Weight:	6.0 lbs. (2.7kg)	12.1 lbs.(5.5kg) *Kit Type 9.9 lbs.	12.1 lbs (5.5kg)
Picture Tube:	240AHB4(N) Non-Glare (M-9004NA) 240AKB31(N) Non-Glare (M-9001NA) 240AKB39(N) Non-Glare (M-9009NA) 240AMB39MD Polish (M-9009A) Visual 9" 90° def. 20mm dia.	310JLB4(N) Non-Glare (M-12004NB/M-K12004NB) 310JLB31J Polish (M-12021PB) 310KRB31(N) Non-Glare (M-12021NB) 310JLB31(N) Non-Glare (M-12021NB/M-K12001NB) Visual 12" 90° def. 20mm dia.	310JLB31(N) Non-Glare (M-12041NB) Visual 12" 90° def. 20mm dia.
Tilt Angle:	10°	10° * Not applicable to Kit Type	10°

COMPOSITE TYPE MODEL

ELECTRICAL CHARACTERISTICS

	9" M-C9004N M-C9001N	12" M-C12001N M-C12004N M-C12009N
Power Requirements:	DC 12V 1.0A max.	DC 12V 1.3A max.
Signal Input:		
Signal LeveL Amplitude	0.5 ~ 2.0Vp-p/Composite 1Vp-p Nominal	0.5 ~ 2.0Vp-p/Composite 1Vp-p Nominal
Sync Signal Ratio	25% ~ 35% 30% Nominal	25% ~ 35% 30% Nominal
Vertical Sync Signal	60Hz	60Hz
Horizontal Sync Signal	15.75KHz	15.75KHz
Polarity	Video-Positive, Sync-Negative	Video-Positive, Sync-Negative
Input Impedance	75 ohms	75 ohms
Video Amplifier Bandwidth:	15MHz typ	15MHz typ
Rise/Fall Time	20ns/20ns typ	20ns/20ns typ
Resolution:	800 TV lines typ (CRT Center)	1000 TV lines typ
Character Area:		
Vertical	4.33 ±0.20" (110 ±5mm)	5.91 ±0.20" (150 ±5mm)
Horizontal	6.30 ±0.20" (160 ±5mm)	8.46 ±0.20" (215 ±5mm)
Blanking Time:		
Vertical	1000μs min.	1000μs min.
Horizontal	10μs min.	10μs min.
Deflection Linearity:		
Vertical	10% max.	10% max.
Horizontal	10% max.	10% max.
Geometric Distortion:		
Vertical/Horizontal	Within 1.5% measured with standard EIA ball chart	Within 1.5% measured with standard EIA ball chart
Operating Ambient Temperature:	0 ~ 55°C	0 ~ 55°C
Storage Temperature:	–40 ~ +65°C	–40 ~ +65°C
Operating Humidity:	5 ~ 90% (Non-Condensing)	5 ~ 90% (Non-Condensing)
Operating Altitude:	0 ~ 10,000 Feet (3,000m)	0 ~ 10,000 Feet (3,000m)
Storage Altitude:	0 ~ 40,000 Feet (12,000m)	0 ~ 40,000 Feet (12,000m)

PHYSICAL CHARACTERISTICS

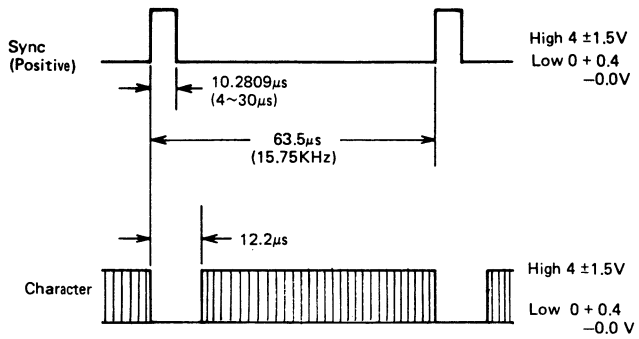
Dimension:		
Height	6.77" (172mm)	8.98" (228mm)
Width	9.49" (241mm)	11.46" (291mm)
Depth	9.47" (240.6mm)	11.62" (295mm)
Weight:	6.0 lbs. (2.7kg)	12.1 lbs. (5.5kg)
Picture Tube:	240AHB4(N) Non-Glare (M-C9004N) 240AKB31(N) Non-Glare (M-C 9001N) Visual 9" 90° def. 20mm dia.	310JLB4(N) Non-Glare (M-C12004N) 310JLB31(N) Non-Glare (M-C12001N) 310RKB39(N) Non-Glare (M-C12009N) Visual 12" 90° def. 20mm dia.
Tilt Angle:	10°	10°

TIMING CHART

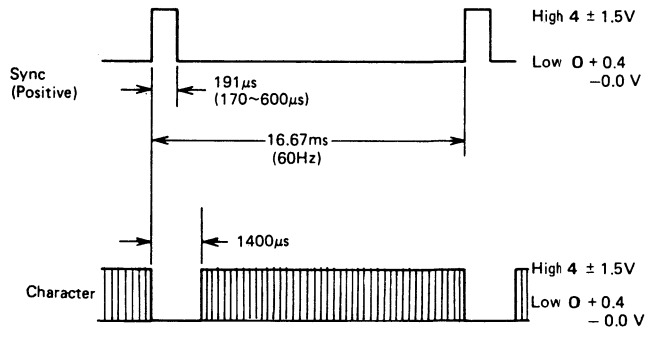
Direct Drive Input type
M-9001NA, M-9004NA, M-9009NA, M-9009A
M-12004NA, M-12004NB, M-K12004NB

H.OSC Internal type
M-12021PB, M-12021NB

Horizontal Sync Timing



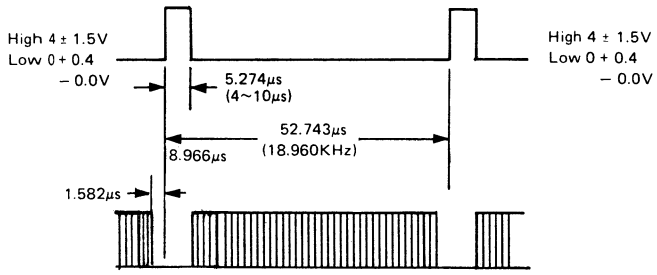
Vertical Sync Timing



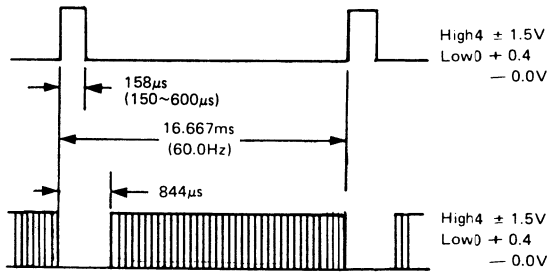
Note: Time Tolerance : ±0.1%
Sample unit is adjusted according to this timing and frequency.

H.OSC Internal type
M-12041NB

Horizontal Sync



Vertical Sync

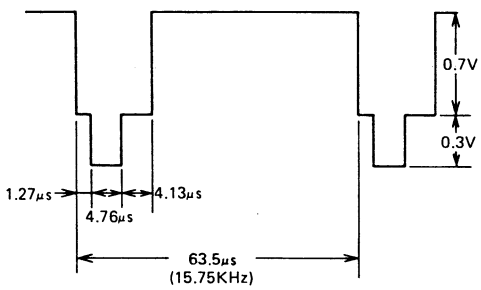


Note: Time Tolerance : ±0.1%
Sample unit is adjusted according to this timing and frequency.

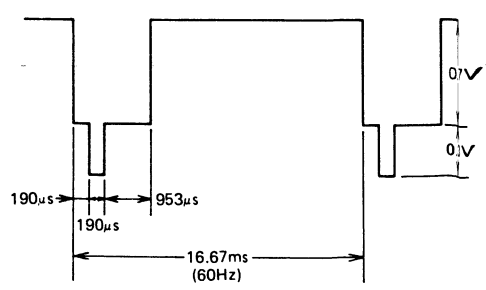
Composite Input type
M-C9001N, M-C9004N, M-C
M-C12001N, M-C12004N, M-C12009N

Timing chart defined in EIA-RS-170

Horizontal



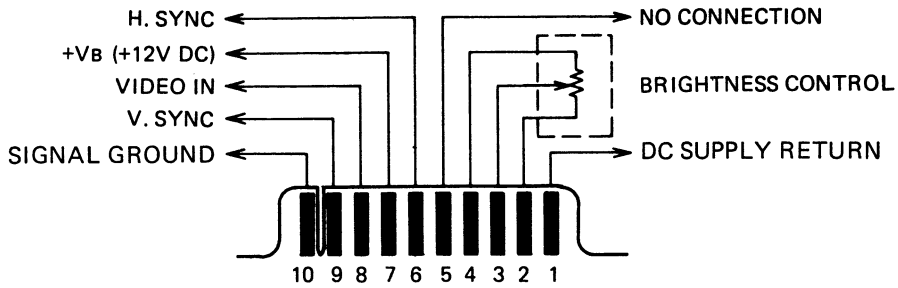
Vertical



Note: Time Tolerence : ±0.1%
Sample unit is adjusted according to this timing and frequency.

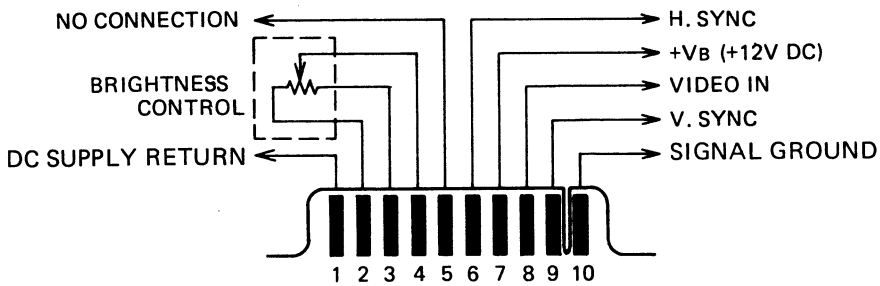
CONNECTOR WIRING

CONNECTOR TYPE [A] Model M-9004NA, M-9001NA, M-9009NA, M-9009A

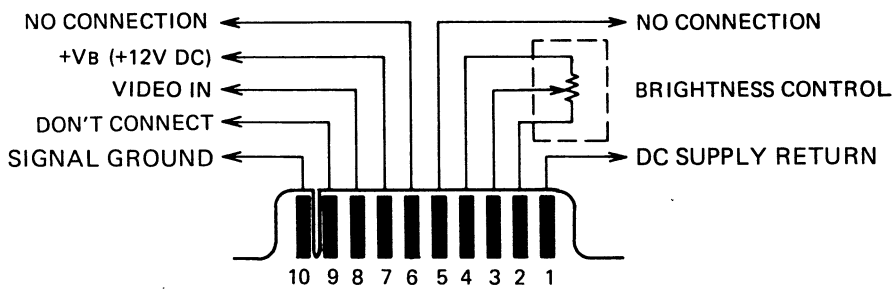


(FOIL SIDE)

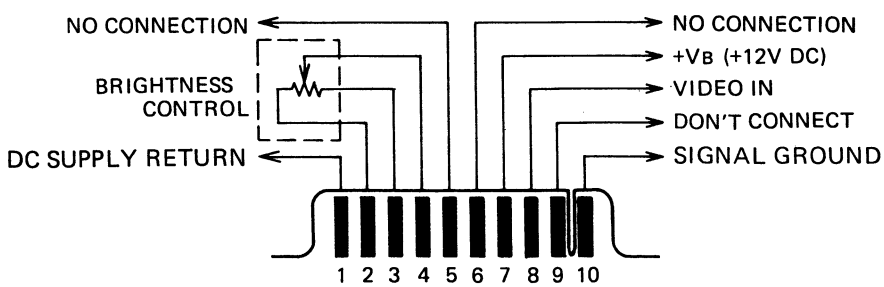
CONNECTOR TYPE [B] Model M-12004NB, M-K12001NB, M-K12004NB, M-12021NB, M-12021PB, M-12041NB



CONNECTOR TYPE [A] Model M-C9004N, M-C9001N



CONNECTOR TYPE [B] Model M-C12001N, M-C12004N, M-C12009N



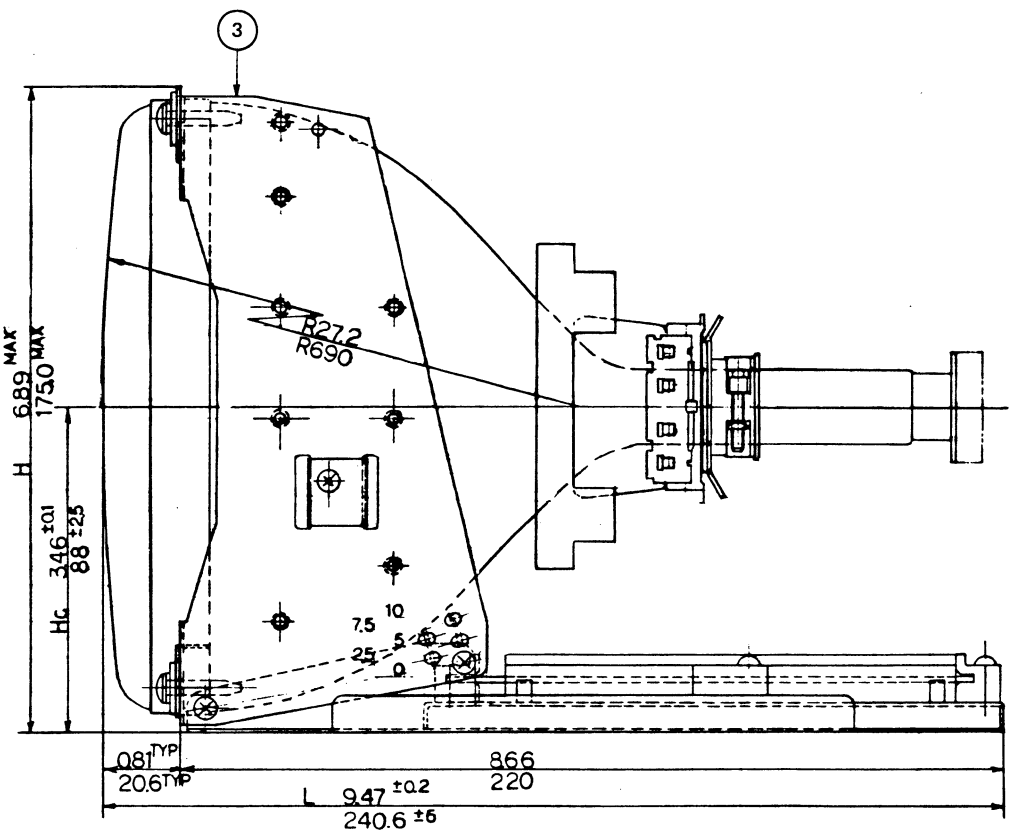
DIMENSION

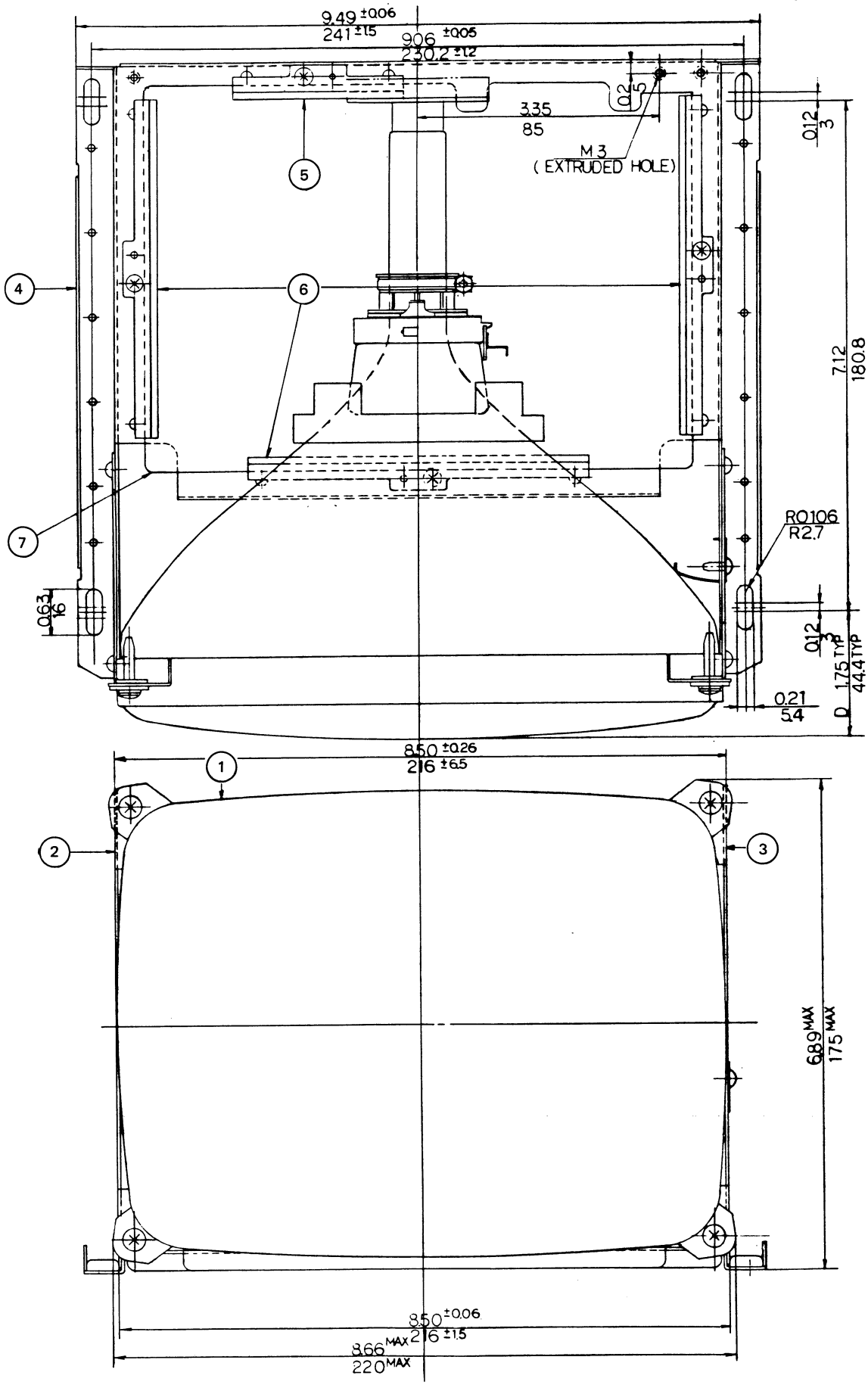
■MODEL M-900×××Series

CRT TILT	H MAX	±0.1 Hc ±2.5	D	±0.2 L ±5
0°	6.89 175.0	3.46 88.0	1.75 44.4	9.47 240.6
2.5°	6.90 175.2	3.51 89.1	1.61 40.8	9.33 237.0
5°	6.89 175.0	3.55 90.1	1.46 37.2	9.19 233.4
7.5°	6.87 174.5	3.58 90.9	1.32 33.5	9.04 229.7
10°	6.84 173.7	3.61 91.6	1.17 19.8	8.90 226.0

Sym	Part Name	qt.	Note
①	CRT	1	
②	CRT FIXING METAL	1	LEFT
③	CRT FIXING METAL	1	RIGHT
④	CHASSIS FIXING METAL	1	
⑤	PRINTED CIRCUIT BOARD STAY	1	SHORT
⑥	PRINTED CIRCUIT BOARD STAY	3	LONG
⑦	PRINTED CIRCUIT BOARD	1	

Dimension:
Upper Side: inch
Bottom Side: mm

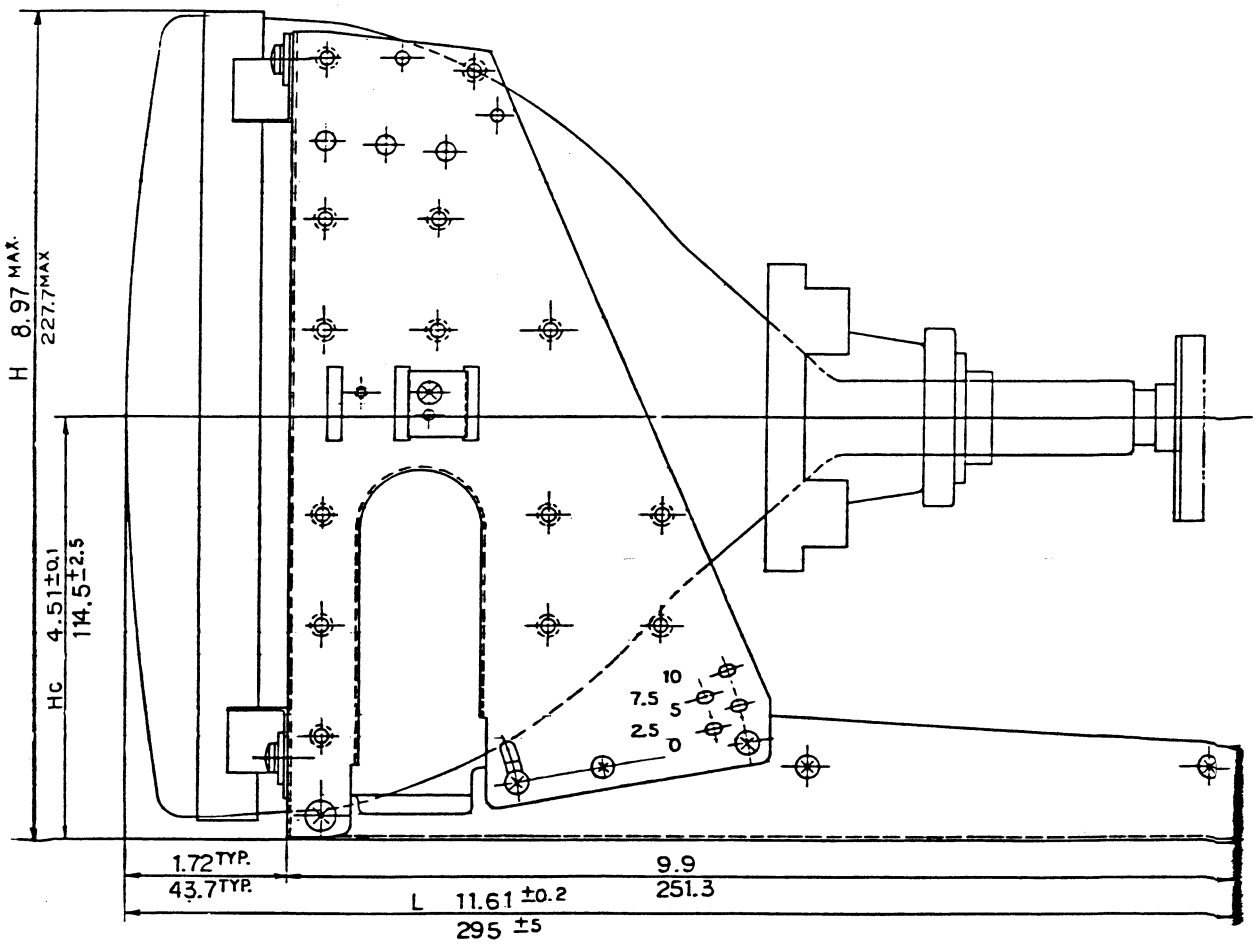


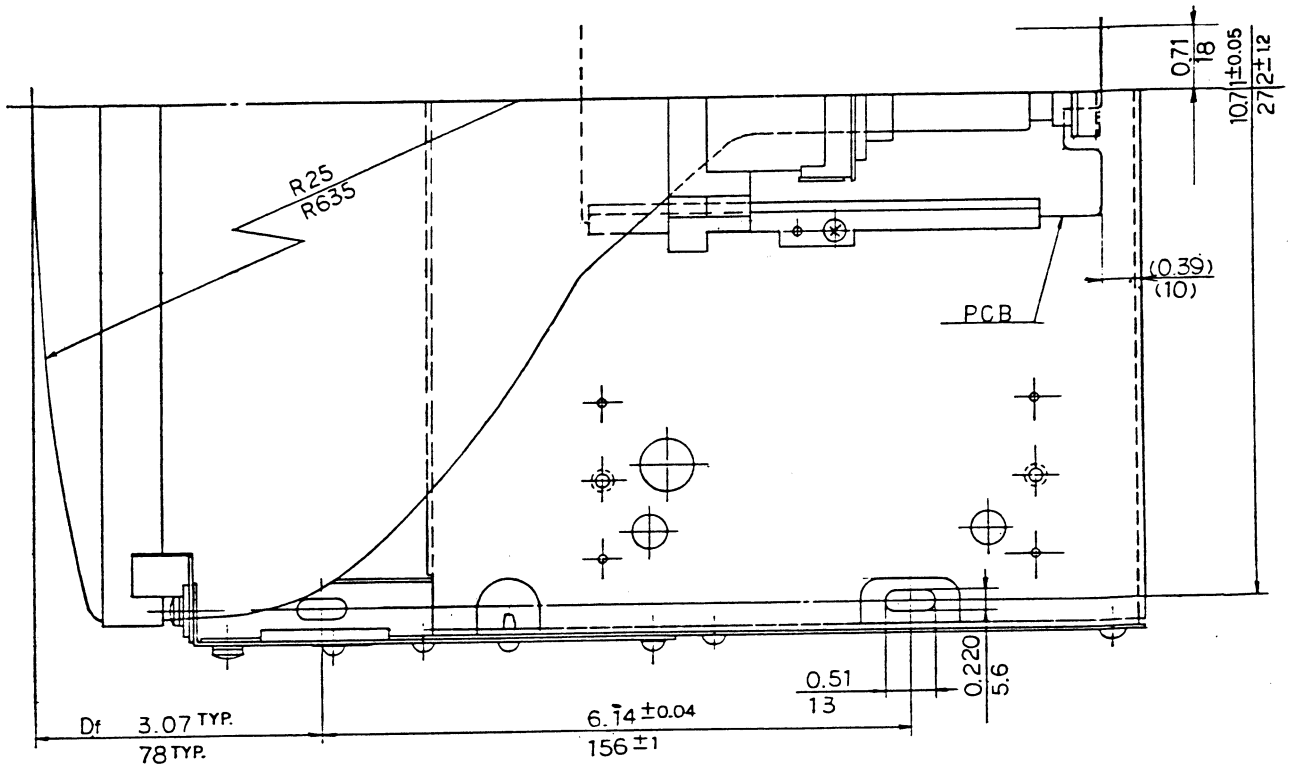

9.49 ±0.06
241 ±1.5
9.06 ±0.05
230.2 ±1.2
3.35
85
0.2
5
0.12
3
M3
(EXTRUDED HOLE)
5
4
6
7
7.12
180.8
R0.106
R2.7
0.63
16
0.12
3
1.75 TYP
44.4 TYP
0.21
5.4
8.50 ±0.26
216 ±6.5
1
2
3
6.89 MAX
175 MAX
8.50 ±0.06
216 ±1.5
8.66 MAX
220 MAX

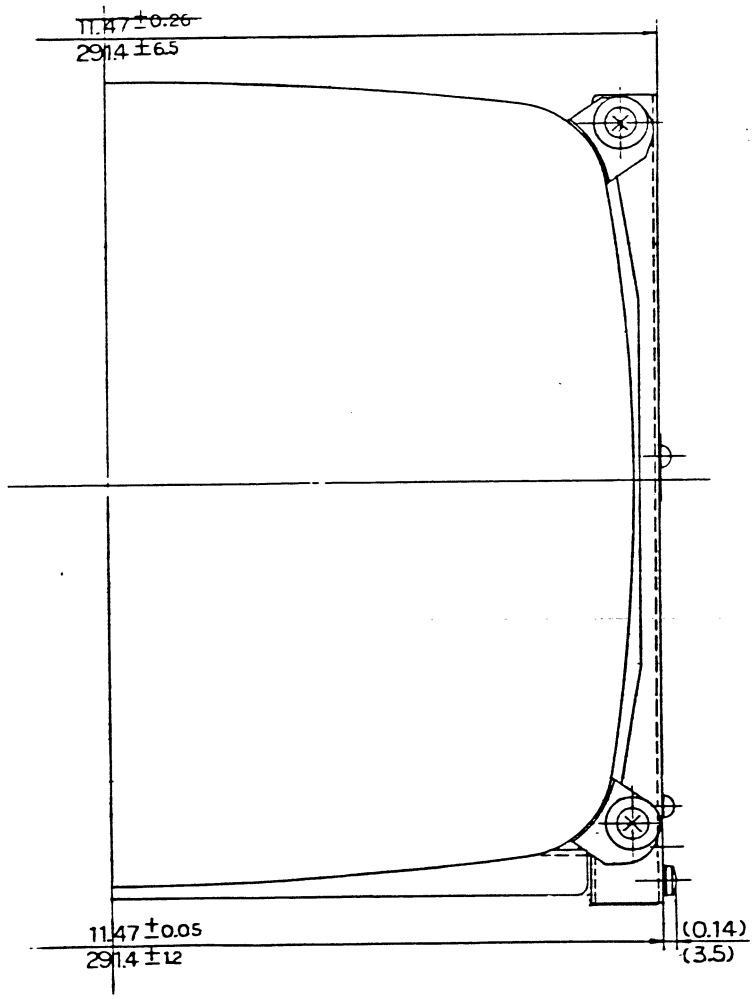
■MODEL M-1200×××Series

CRT TILT	H MAX	±0.1 HC ±2.5	Do TYP	Dt TYP.	±0.2 L ±5
10°	8.99 228.3	4.81 122.1	3.95 100.4	2.30 58.4	10.84 275.4
7.5°	9.03 229.3	4.74 120.5	4.15 10.55	2.50 63.5	11.04 280.4
5°	9.06 230.0	4.67 118.7	4.34 110.4	2.69 68.4	11.24 285.4
2.5°	9.07 230.2	4.59 116.7	4.54 115.2	2.88 73.2	11.43 290.2
0°	8.97 227.7	4.51 114.5	4.72 120.0	3.07 78.0	11.61 295

Dimension:
Upper Side: inch
Bottom Side: mm

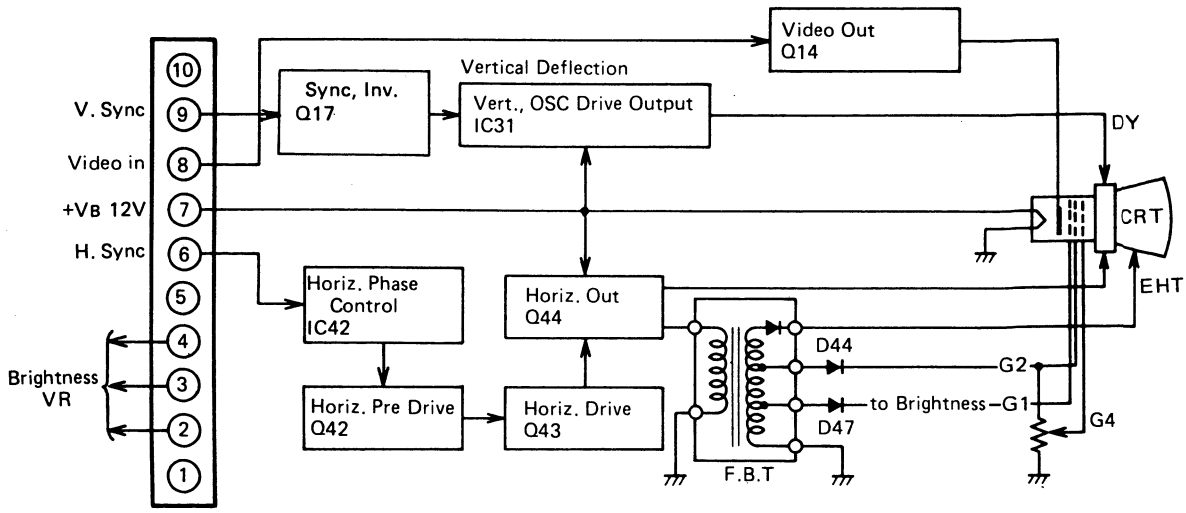



R25
R635
0.71
18
10.71±0.05
272±1.2
(0.39)
(10)
PCB
0.51
13
0.220
5.6
Df 3.07 TYP.
78 TYP.
6.14±0.04
156±1

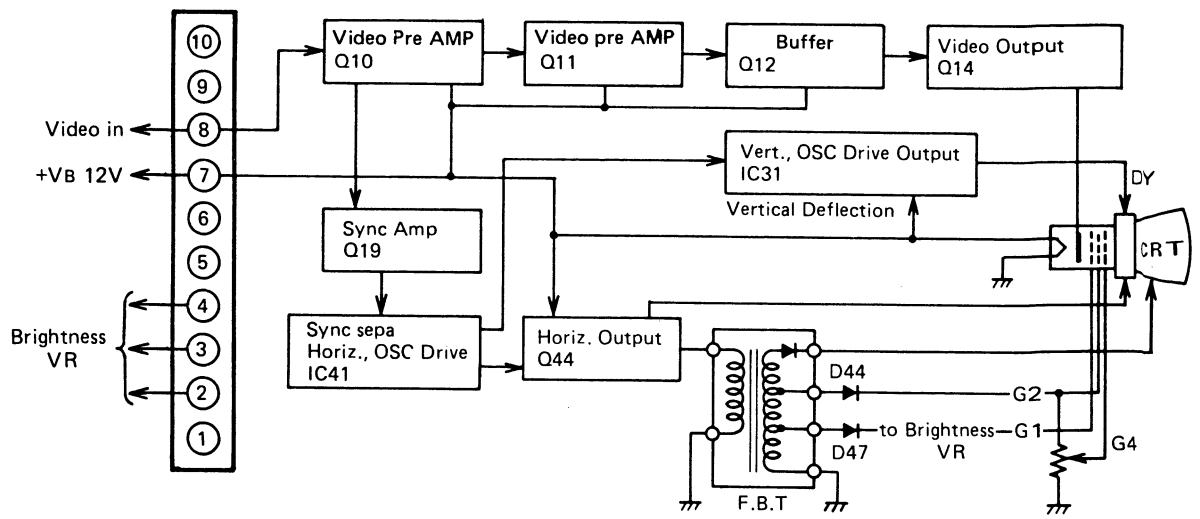

11.47±0.26
291.4±6.5
11.47±0.05
291.4±1.2
(0.14)
(3.5)

BLOCK DIAGRAM

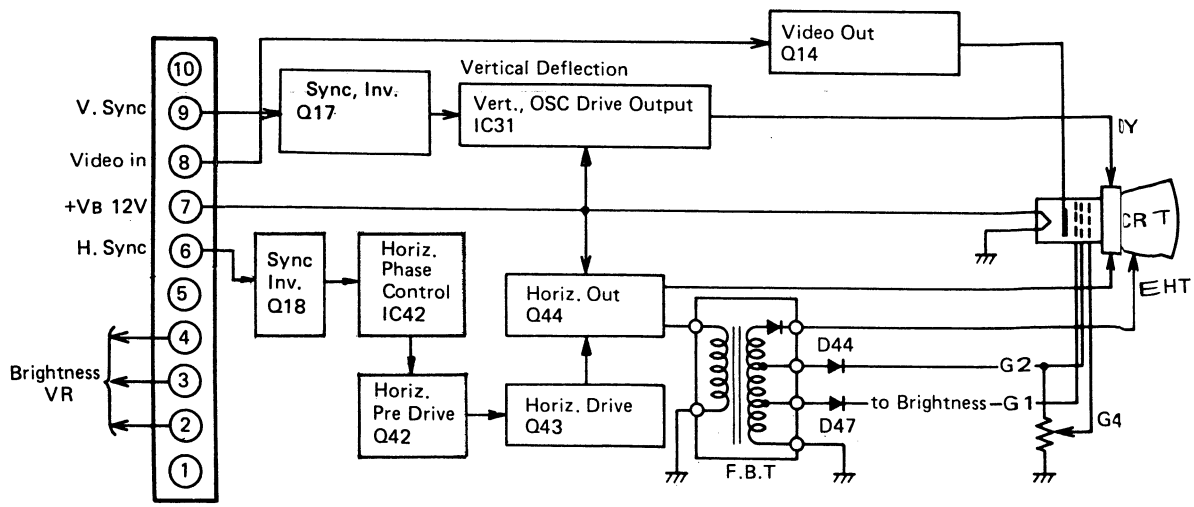
Models M-9001NA, M-9004NA, M-9009A, M-9009A, M-12004NB, M-K12004NB, M-K12001NB



Models M-C9001N, M-C9004N, M-C12001N, M-C12004N, M-C12009N

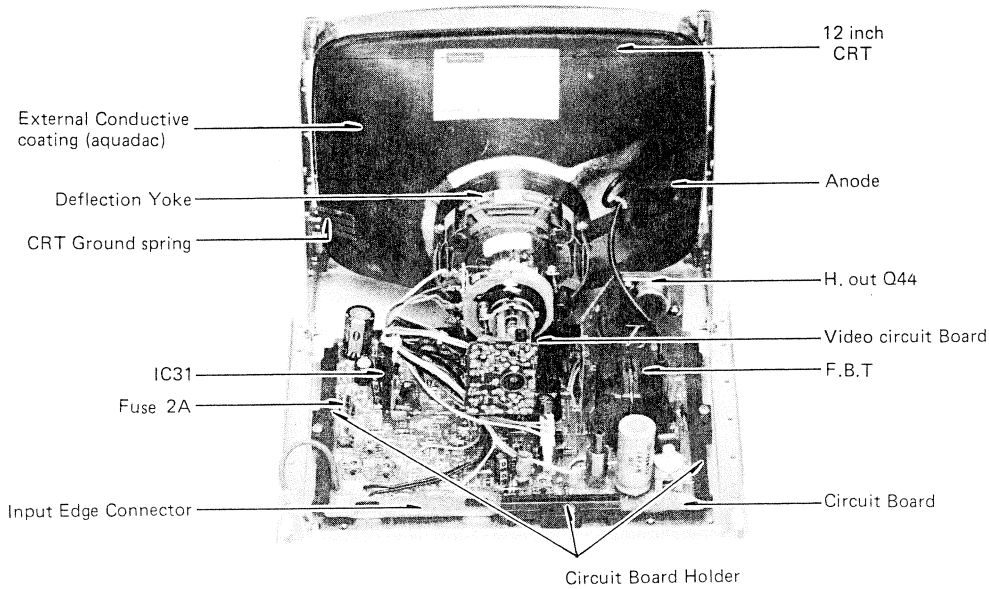


Models M-12021PB, M-12021NB, M-12041NB

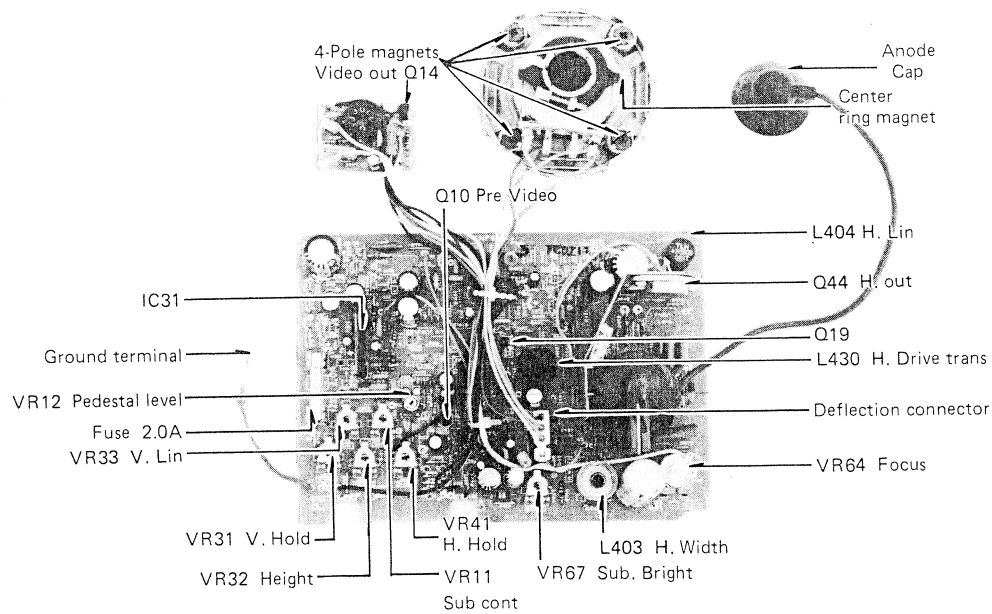


MONITOR CIRCUIT BOARD DETAL COMPONENT LOCATION

This photograph explains model M-12004NB. However it can be applied to other models as the basic chassis is commonly used.

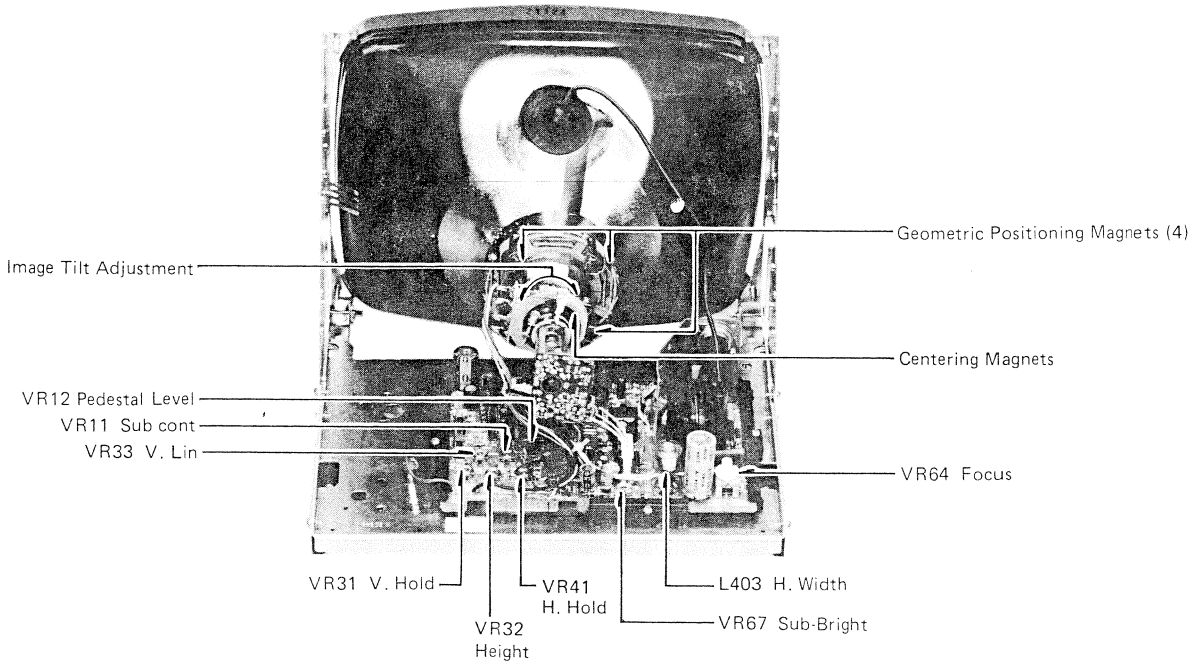


Rear Chassis View



Monitor Circuit Board Detail-Component Location

CONTROL DESCRIPTION



Vertical Hold (VR31):
Stabilizes the raster vertically.

Vertical Height (VR32):
Adjusts the height of the active display area.

Vertical Linearity (VR33):
Adjusts the height of the characters within the active display area.

Horizontal Hold (VR41): (Compsite only)
VR41 can be considered a fine adjustment for the horizontal stability and position of the display area Adjust VR41 to center the display area.

Horizontal Width (L403):
Adjusts the width of the active display area.

Sub Bright:
This control adjust the raster brightness. (Internal)

Brightness:
Adjust the brightness of the raster.
(Remote of customer)

Focus (VR64):
Adjusts the focus in the center of the active display area. Keep the whole picture uniform and then adjust it to the best point.

Tilt Adjustment (1):
The tilt adjustment entails the use yoke clamp.
Loosening the yoke clamp and rotating the yoke either clockwise or counter-clockwise corrects the tilt of the raster.

Centering Magnets (2):
(Located on the yoke between the yoke electrical termination and the yoke clamp.) These controls are used to center the raster vertically.

Geometric Positioning Magnets (4):
(Located around the yoke periphery) adjusts the geometric shape of the active display area.

Sub cont (Composite type only) VR11:
Controls the brightness of characters by changing input signal level.

Pedestal level (Composite type only)
Sets the standard of pedestal level by means of VR12.

ALIGNMENT PROCEDURE

PREPARATION

1. Connect the 10-Pin connecter from the proper logic to the defined input signal.
2. Apply power to the CRT data display and allow the monitor to stabilize.
3. Adjust coils by means of a hexagonal tuning tool (non-metalic).
   Variable resistoer by – screw driver and deflection yoke (deflection distortion) by square tuning tool (non-metalic).
4. All controls are set at optimum position prior to shipment.

ADJUSTMENT PROCEDURE

• Image Tilt Adjustment

Loosen the deflection yoke clamp and turn in the arrow directions to adjust tilt. (See Fig. 2).

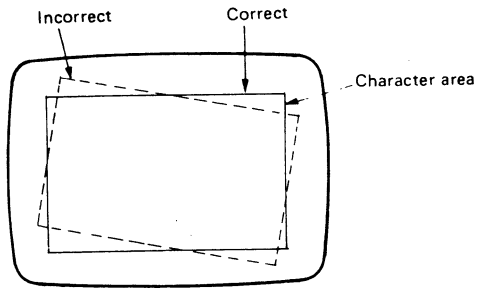


Fig. 2

• Vertical Hold Adjustment

Adjust (VR31) until the image becomes stable vertically as shown in Fig. 3.

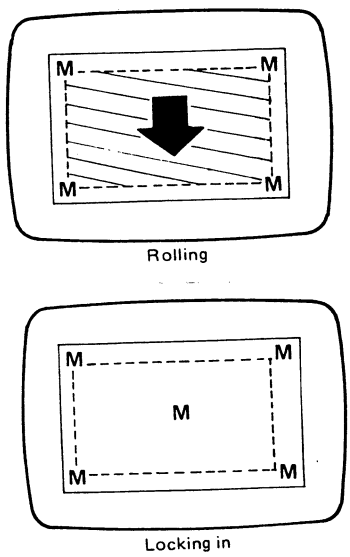


Fig. 3

• Vertical Hold Adjustment

Checking of height, width and bright should be performed more than 30 minutes after power is applied.
Measure the luminous intensity near the center of CRT and set at 50 lux ±20% (40 to 60 lux). These adjustment are performed on the basis of the input signal of Timing chart (page 6). Adjustment of picture and its associated parts should be made in the order of Sub-contrast, Sub-bright and Pedestal level.

• Horizontal Hold Adjustment

Turn (VR41) to set the raster area in the horizontal center of the CRT. (See Fig. 4.)

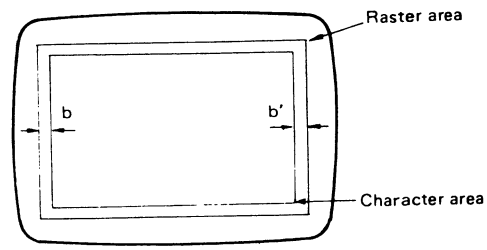


Fig. 4

• Vertical Height Adjustment

Adjust the vertical height (VR32) to set the vertical height of the active character area as shown in Fig. 5.

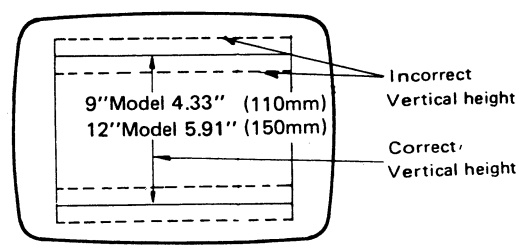


Fig. 5

• Horizontal width Adjustment

Adjust the horizontal width coil (L403) to set the proper width of the active character area as shown in Fig. 6.

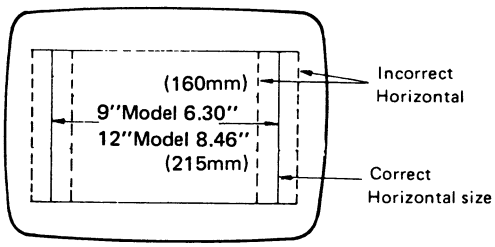


Fig. 6

• Vertical Linearity Adjustment

Adjust (VR33) for uniform character height within the active character area as shown in Fig. 7.

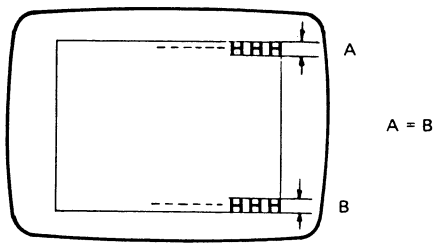


Fig. 7

• Centering Magnet Adjustments

Rotate the centering magnet tabs away from each other until the character area is centered on the screen as shown in Fig. 8.

Before this adjustment, be sure to ascertain H. hold.

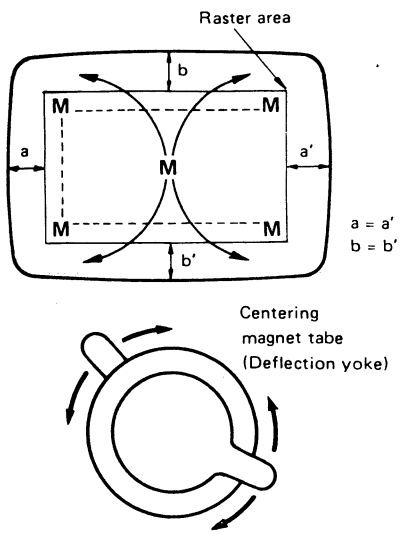


Fig. 8

• Focus Control Adjustment

Adjust (VR64) until optimum focus is seen on the characters displayed within the active character area.

• Sub Brightness Adjustment

Look at a place 30cm distant from the CRT surface and set at a point where the raster slightly comes out, with the brightness VR (Customer) set at MAX. In this case, fully rotate Pedestal Level clockwise. (Contrast of characters minimizes.)

• Brightness Adjustment (Customer Supply)

Controls the brightness of the raster by means of the external control VR (Customer Supply). Picture brightness is set at 40 lux before leaving the factory.

• Sub Contrast Adjustment (composite type only)

Connect an oscilloscope (with low capacity probe) to the R174 as shown in Fig. 9.

Then adjust VR11 to obtain 3.0Vp-p.

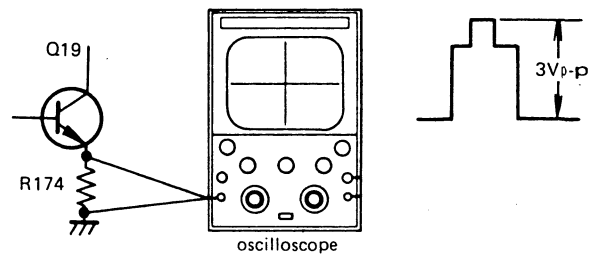


Fig. 9

• Pedestal Level Adjustment (composite type only)

After the adjustment of sub-brightness and sub-contrast, connect an oscilloscope (with low capacity probe) to the R144 as shown in Fig. 10.

Then adjust VR12 to obtain 10V DC.

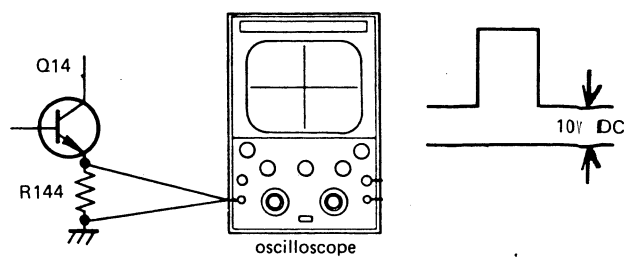


Fig. 10

• Correcting Magnet of Geometric Distortion (4)

Adjust each "Distortion Correcting Magnet" until the active character area is adjusted to the proper shape as shown in Fig. 11.

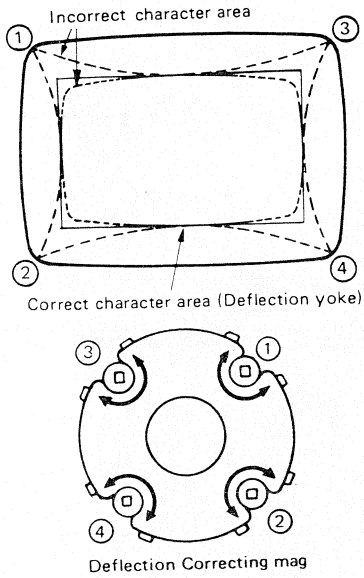


Fig. 11

• Adjustment of CRT angle

CRT angle has been adjusted at 0° prior to shipment, but it can be changed at need as shown in the figure below.

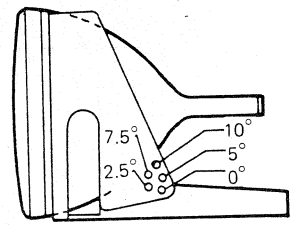


Fig. 12

PREASSEMBLY INSPECTION AND HANDLING INSTRUCTIONS

Caution:

Be sure all handling of the CRT Display is done by the CRT mounting brackets. At no time should the wires be used as a means of moving or carrying a given CRT Display. The CRT neck is the most fragile part of the CRT Display Module and extreme care should be taken not to bump, tap, or otherwise excess force on this neck.

Before applying power to the CRT Display an inspection should be preformed to insure that any foreign material has not been dropped in any part of the CRT Display.

1. Insure that the proper signal and power connections are made in accordance.
2. Apply power to monitor under test and allow monitor to stabilize for a minimum of 5 minutes.
   Note: All adjustments have made at the factory. This procedure is to insure that these adjustments have been made correctly.
3. Turn External Brightness Control to maximum and raster should be slightly visible.
4. Check monitor for proper centering.
5. Check monitor for the specified active character area per Page 3, 4 of this Manual.
6. Check for Geometric Distortion.
7. Check focus.
8. Check Power Supply Voltages in accordance per Page 2 of this Manual.

CAUTION FOR SERVICING

Be sure to provide power supply sequence of more than 100mS.

Power ON-OFF

Do not turn OFF power supply when the CRT heater is not sufficiently heated. Otherwise, CRT may be burned in spot.

In case of servicing or replacing CRT, high voltage sometimes remains in the anode of CRT. So, completely discharge high voltage before servicing or replacing CRT so as to prevent a shock to the serviceman.

In this case, discharge to the external conductive coating (aquadag) of CRT.

Discharging to other places will cause troubles. The heat sink of horizontal output transistor is applied with +B. So, do not earth it in case of servicing.

Use care to handle IC42.

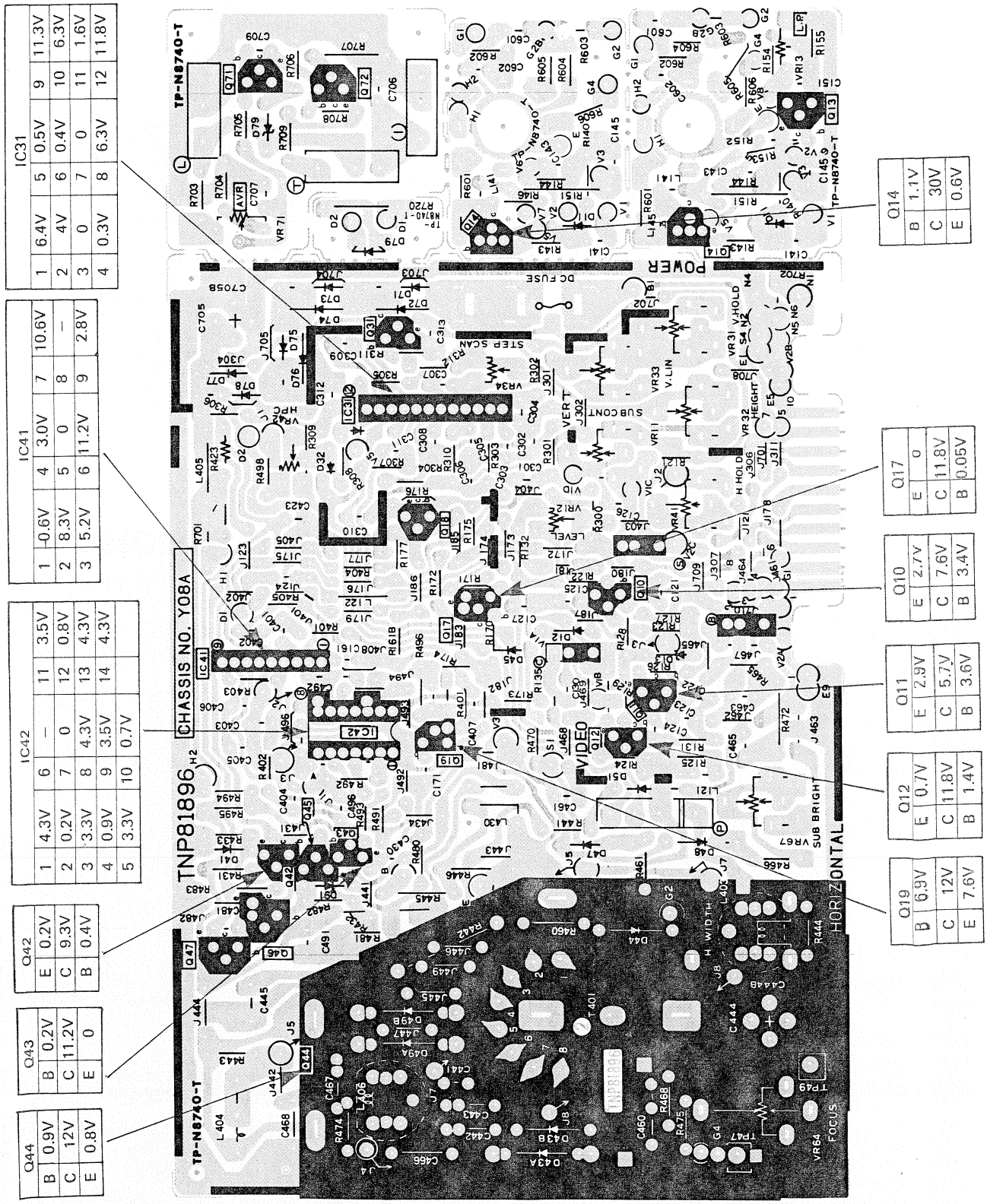
Special care should be taken not to apply overvoltage or static electricity to IC42, as it is of C-MOS.

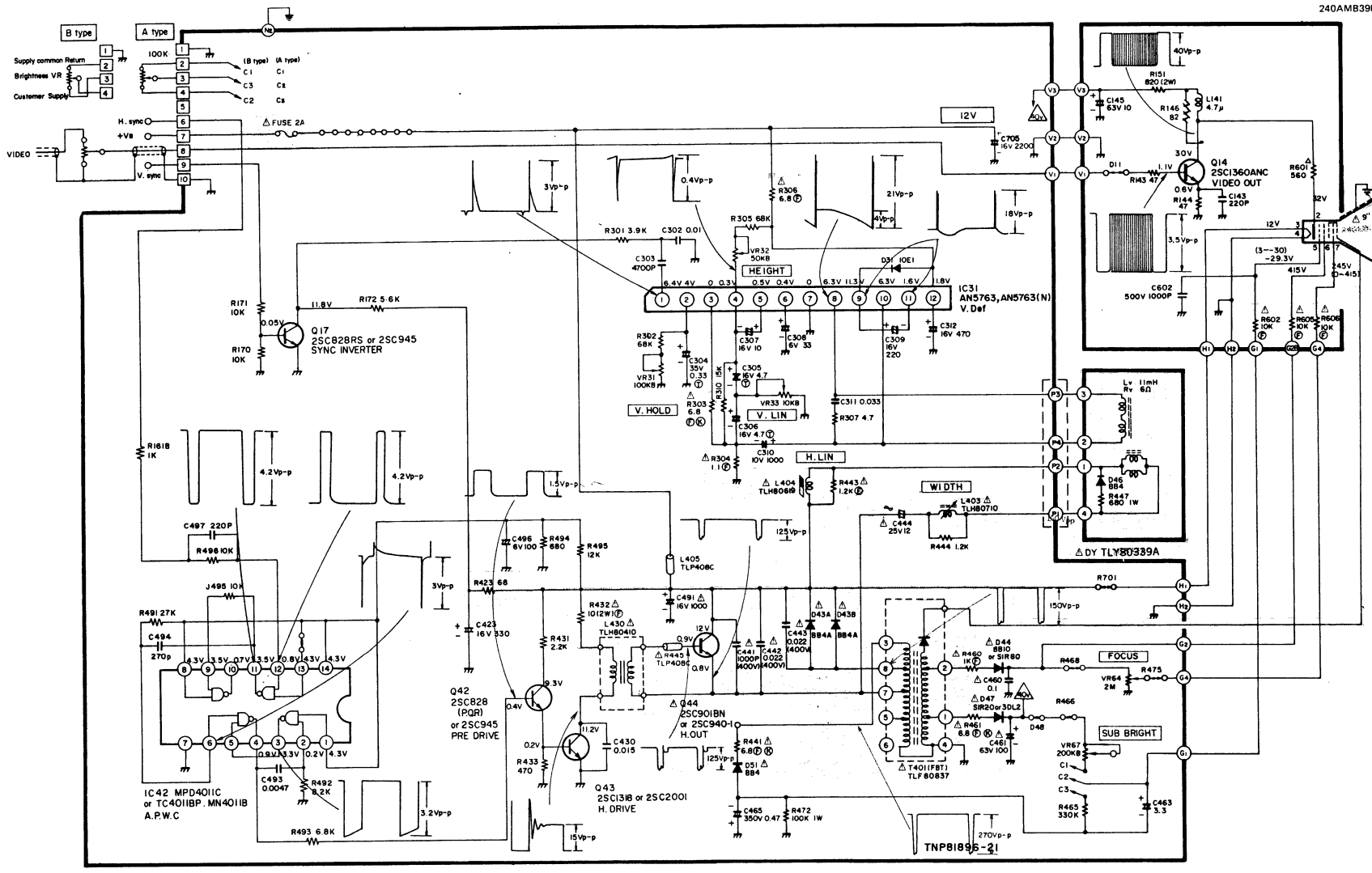
In case of storaging or transporting it, be sure to take some countermeasures for static electricity. When using a soldering iron, be sure to connect it to the earth.

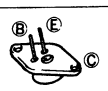
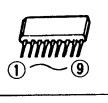
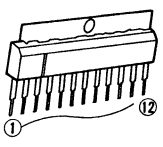
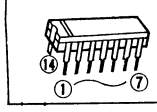
The unused terminal should be soldered without fail

MONITOR CIRCUIT BOARD-SOLDER VIEW

TNP81896 (Models M-9004NA, M-C9004N, M-9009A, M-9009NA)
(Models M-9001NA, M-C9001N)





TRANSISTOR BASE INFORMATION	
LOCATION	PARTS NAME
	2SC828 2SC829C 2SC945 2SC1318
	2SC1360ANC
	2SC940 2SC901BN
	AN5753 AN5752
	AN5762 AN5763 AN5763(N)
	MPD4011C TC4011BP MN4011B

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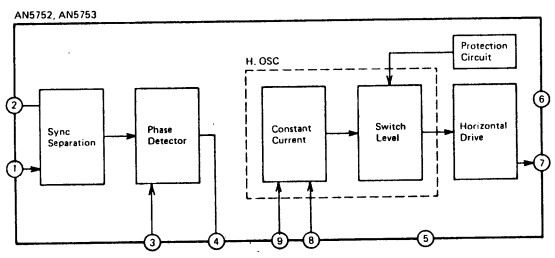
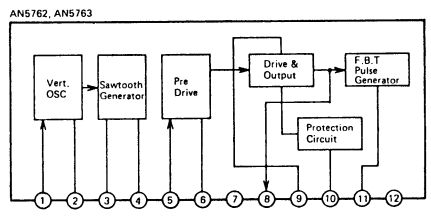




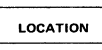
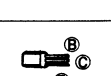
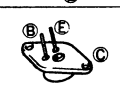
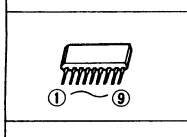
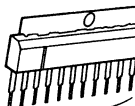
NOTE

1. RESISTOR
   All resistors are carbon 1/4W resistor, unless otherwise noted the following marks.
   Unit of resistance is OHM (Ω). (K=1,000, M=1,000,000)
   ⚠ : Solid resistor
   Ⓕ : Non Flame

2. CAPACITOR
   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks.
   Unit of capacitance is μF, unless otherwise noted.
   Ⓜ : Polyester
   Ⓢ : Polystylene capacitor
   ⏚ : Electrolytic capacitor
   Ⓣ : Tantalum

3. COIL
   Unit of inductance is μH.

4. VOLTAGE MEASUREMENT
   a. Voltage is measured by a digital meter with DC 10MΩ OHM/V receiving normal signal.
   b. Use each measurement voltage for reference.

TRANSISTOR BASE INFORMATION	
LOCATION	PARTS NAME
	2SC828 2SC829C 2SC945 2SC1318
	2SC1360ANC
	2SC940 2SC901BN
	AN5753 AN5752
	AN5762 AN5763 AN5763(N)
	MPD4011C TC4011BP MN4011B

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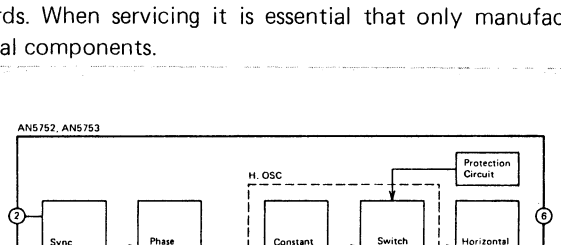

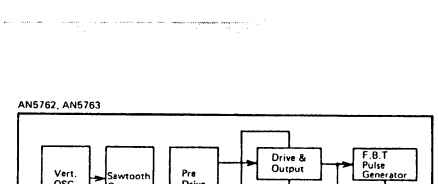

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   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks.
   Unit of capacitance is μF, unless otherwise noted.
   Ⓜ : Polyester
   ⁺‖⁻ : Electrolytic capacitor
   Ⓢ : Polystylene capaci·
   Ⓣ : Tantalum

3. COIL
   Unit of inductance is μH.

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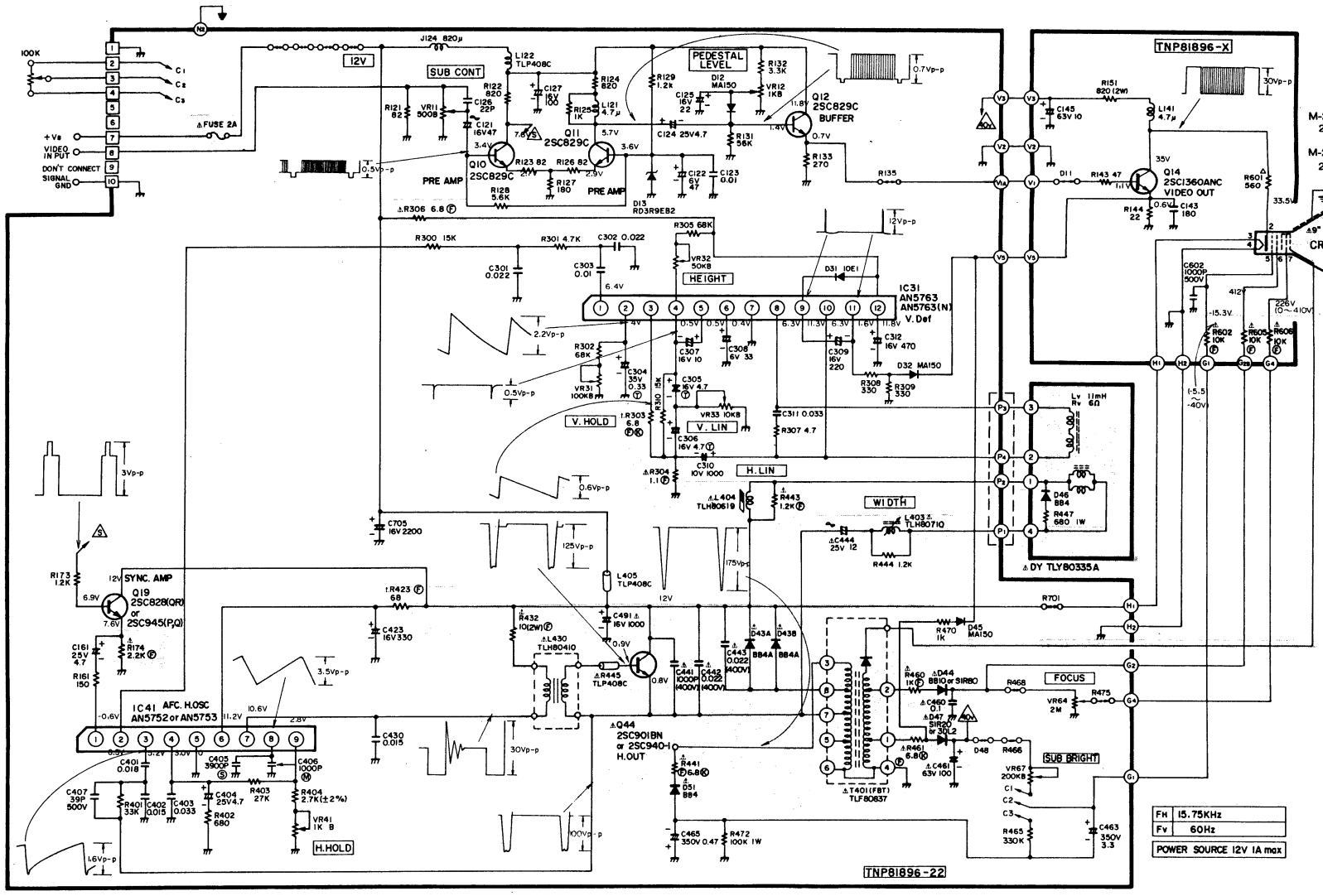
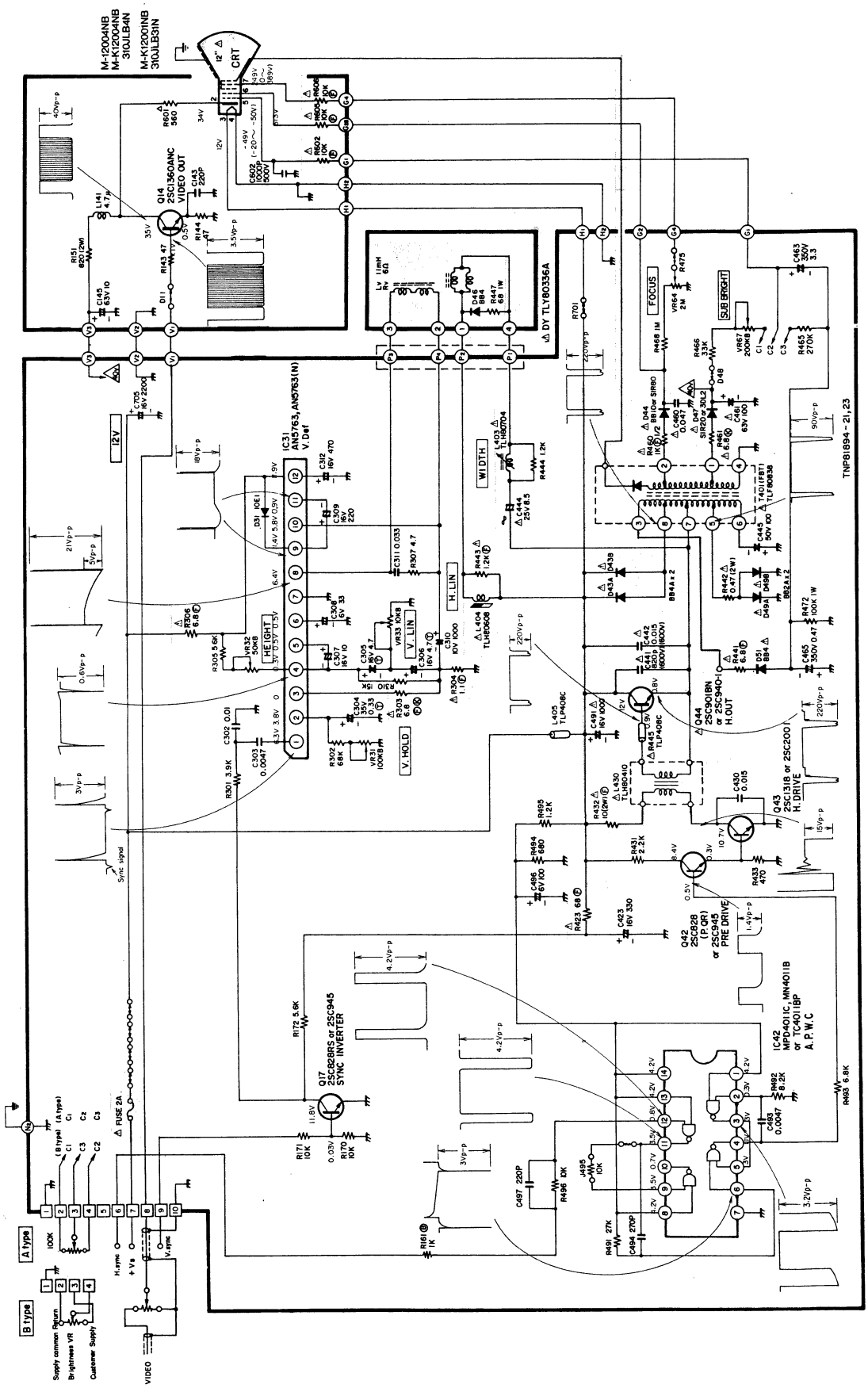
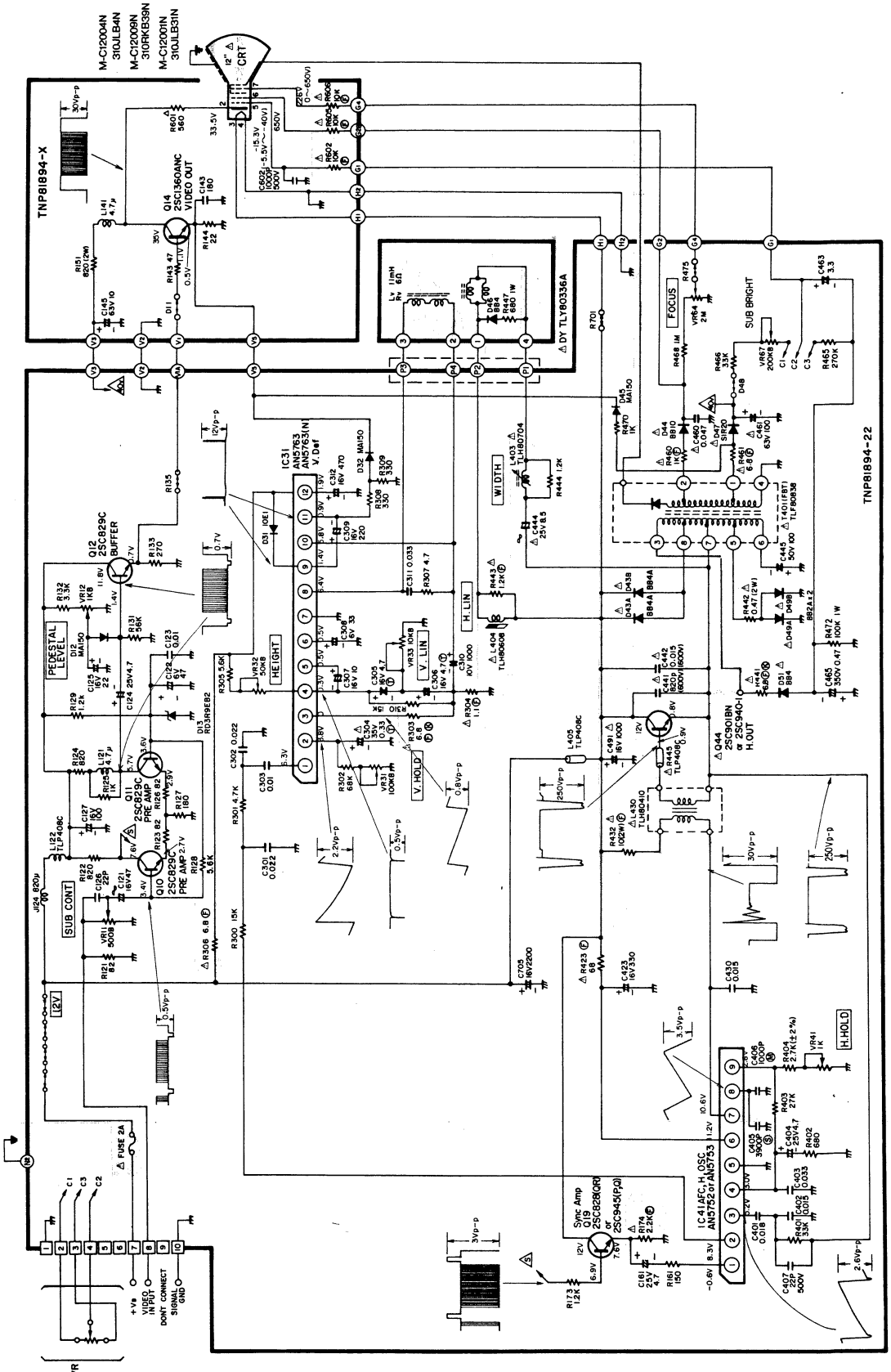
   a. Voltage is measured by a digital meter with DC 10MΩ OHM/V receiving normal signal.
   b. Use each measurement voltage for reference.



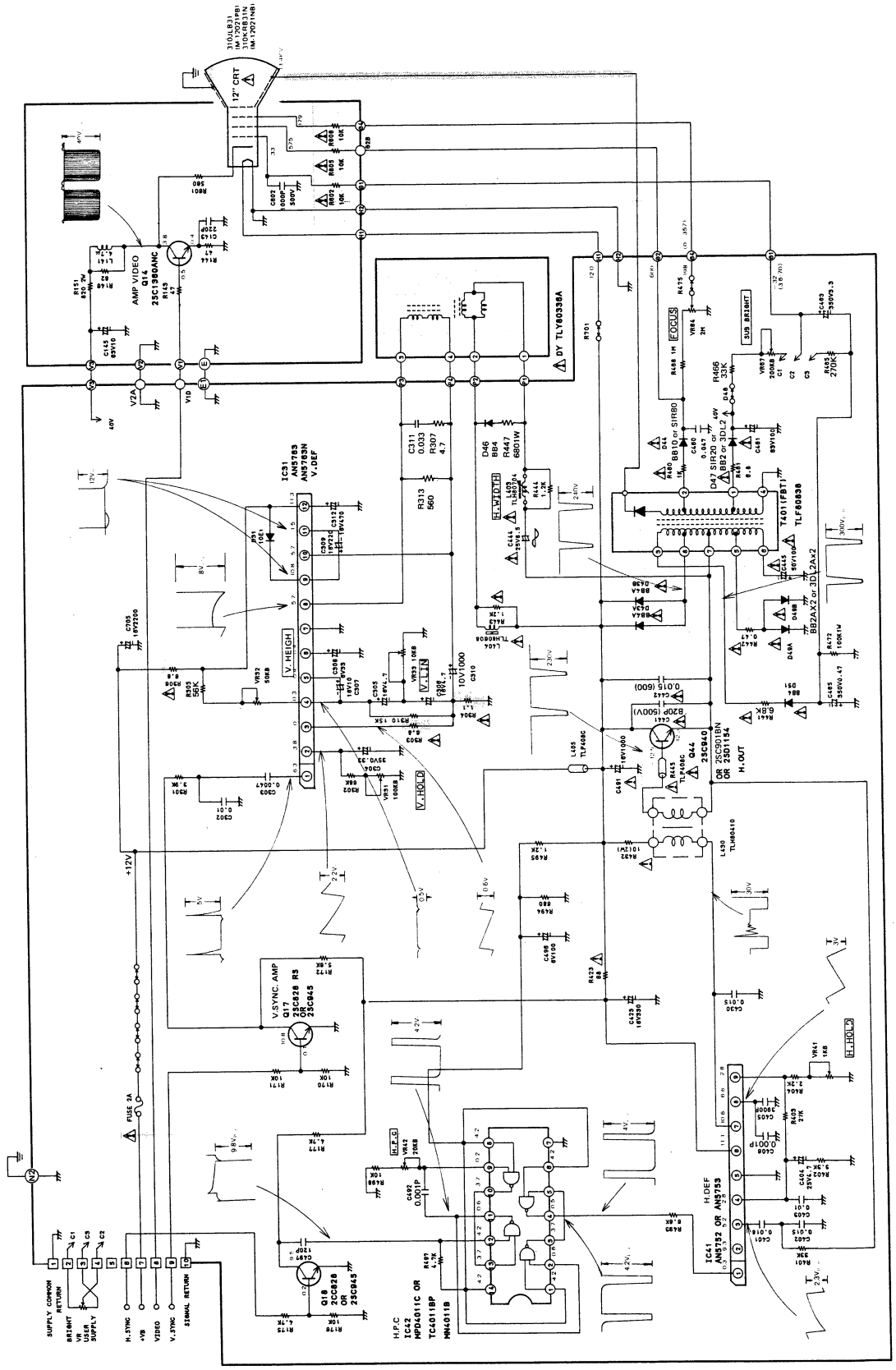
MODEL M-12004NB/M-K12004NB/M-K12001NB



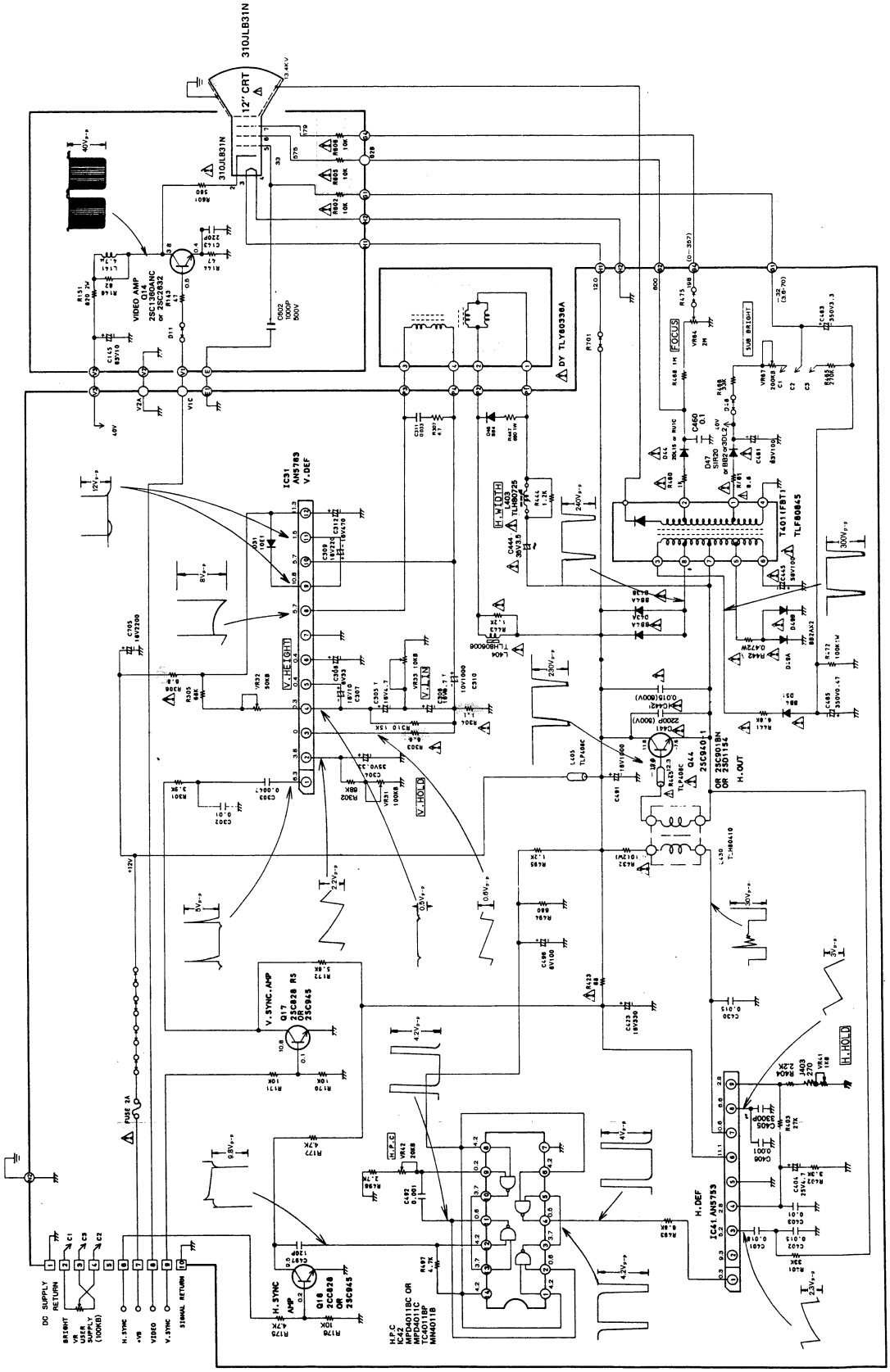
MODEL M-C12004N/M-C12009N/M-C12001N



MODEL M-12021PB/M-12021NB

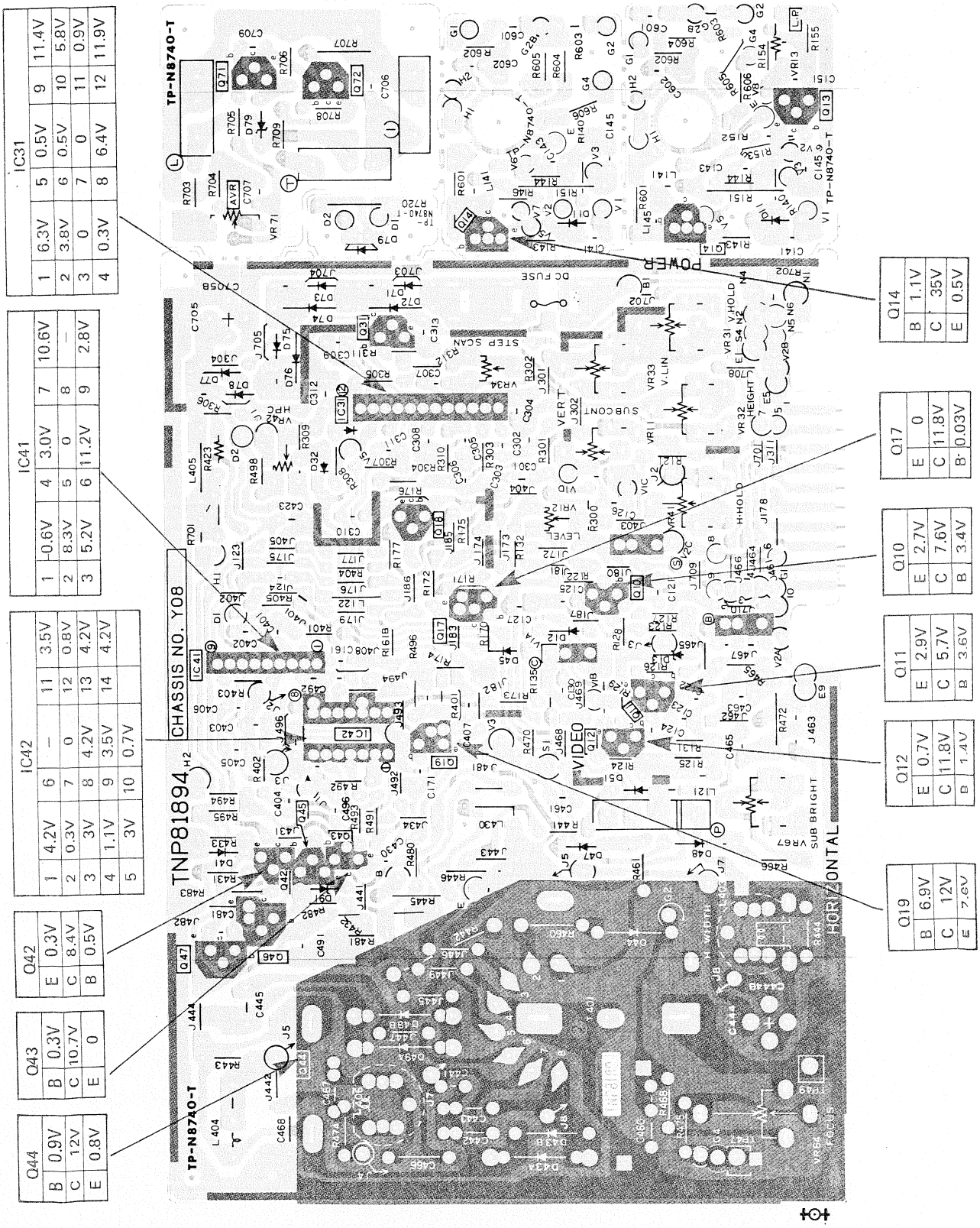


MODEL M-12041NB



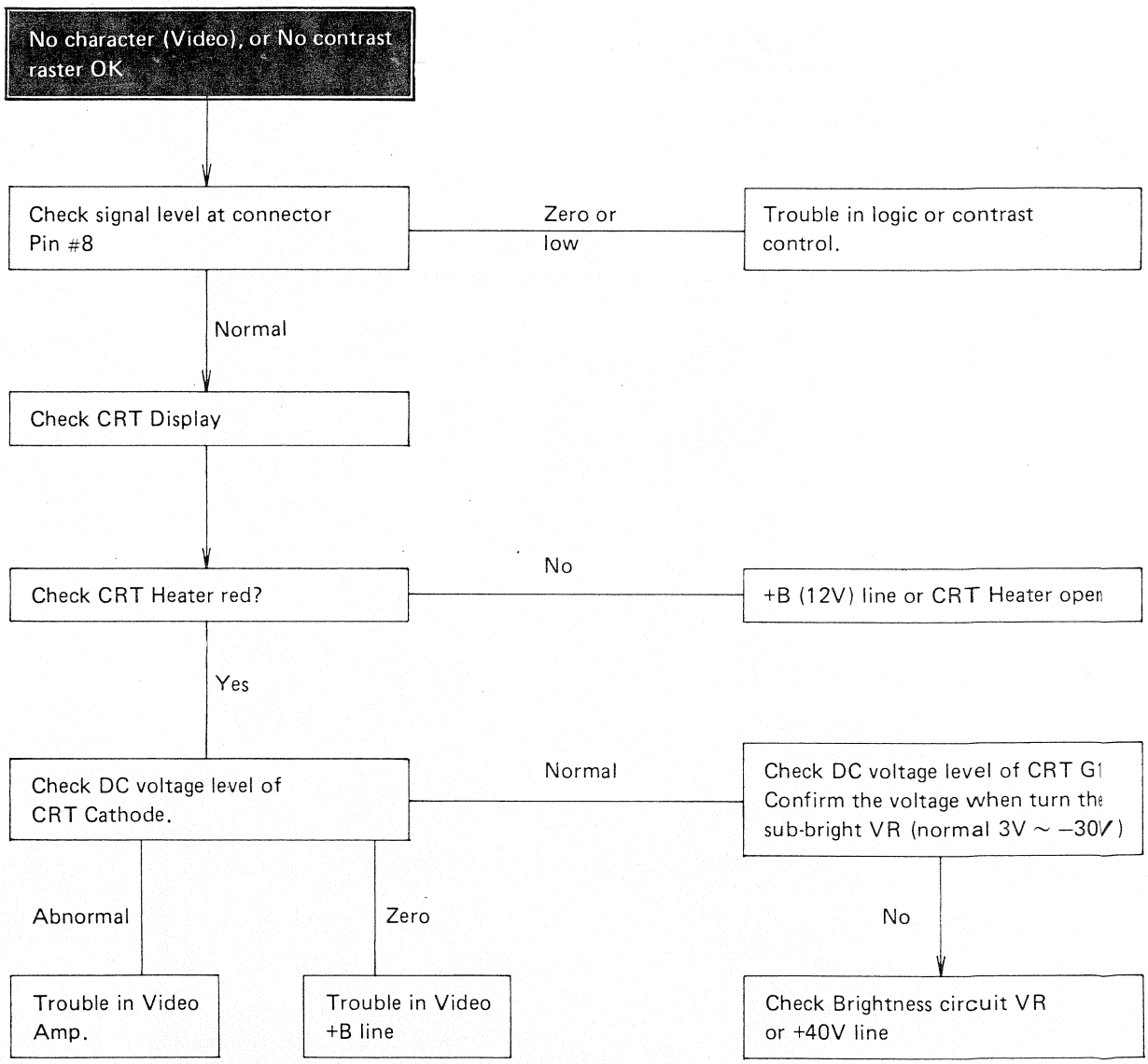
MONITOR CIRCUIT BOARD-SOLDER VIEW

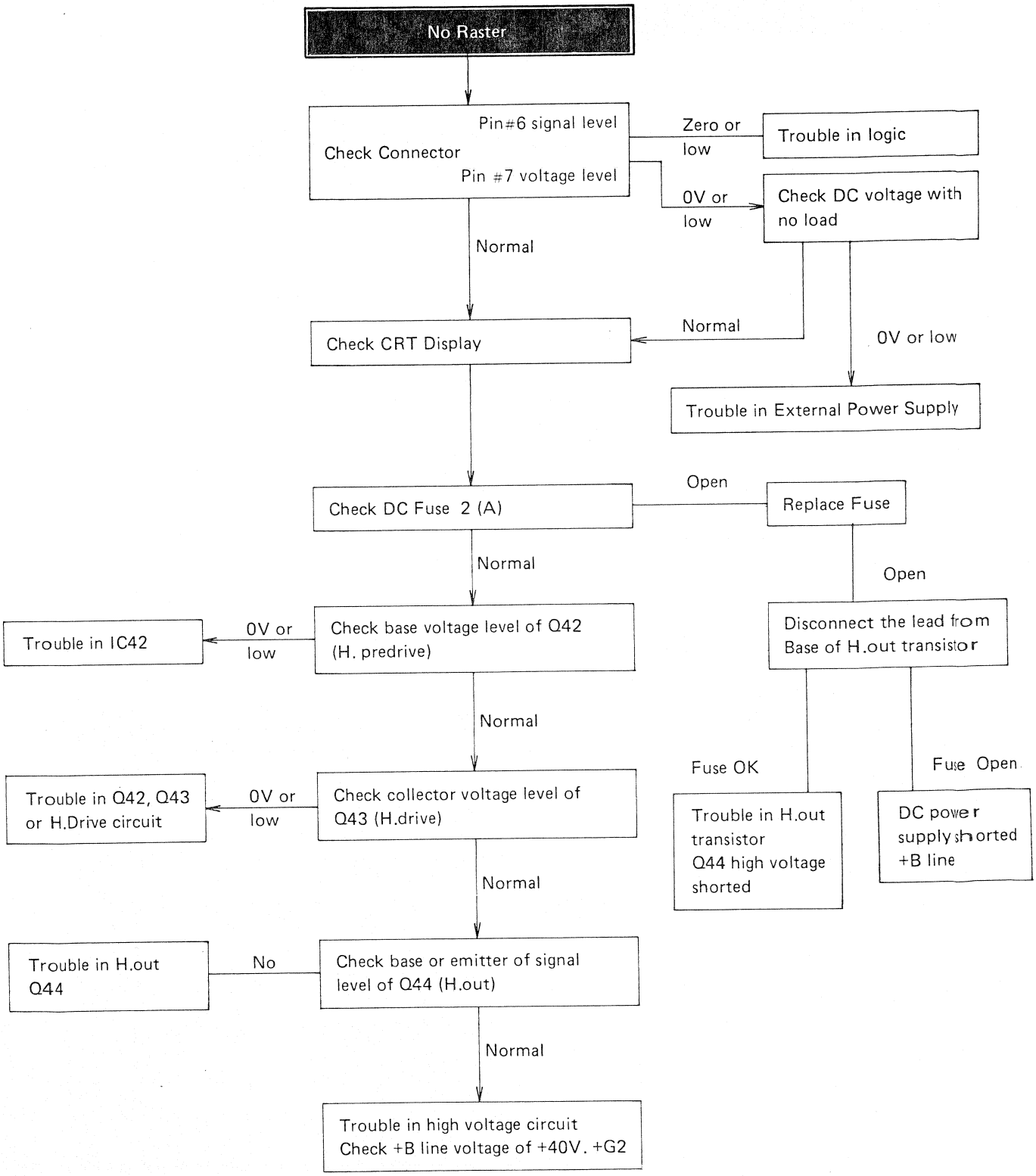
TNP81894 (Models M-12004NB, M-C12004N, M-K12004NB, M-12021PB)
(Models M-12021NB, M-12041NB, M-K12001NB, M-C12001N, M-C12009N)

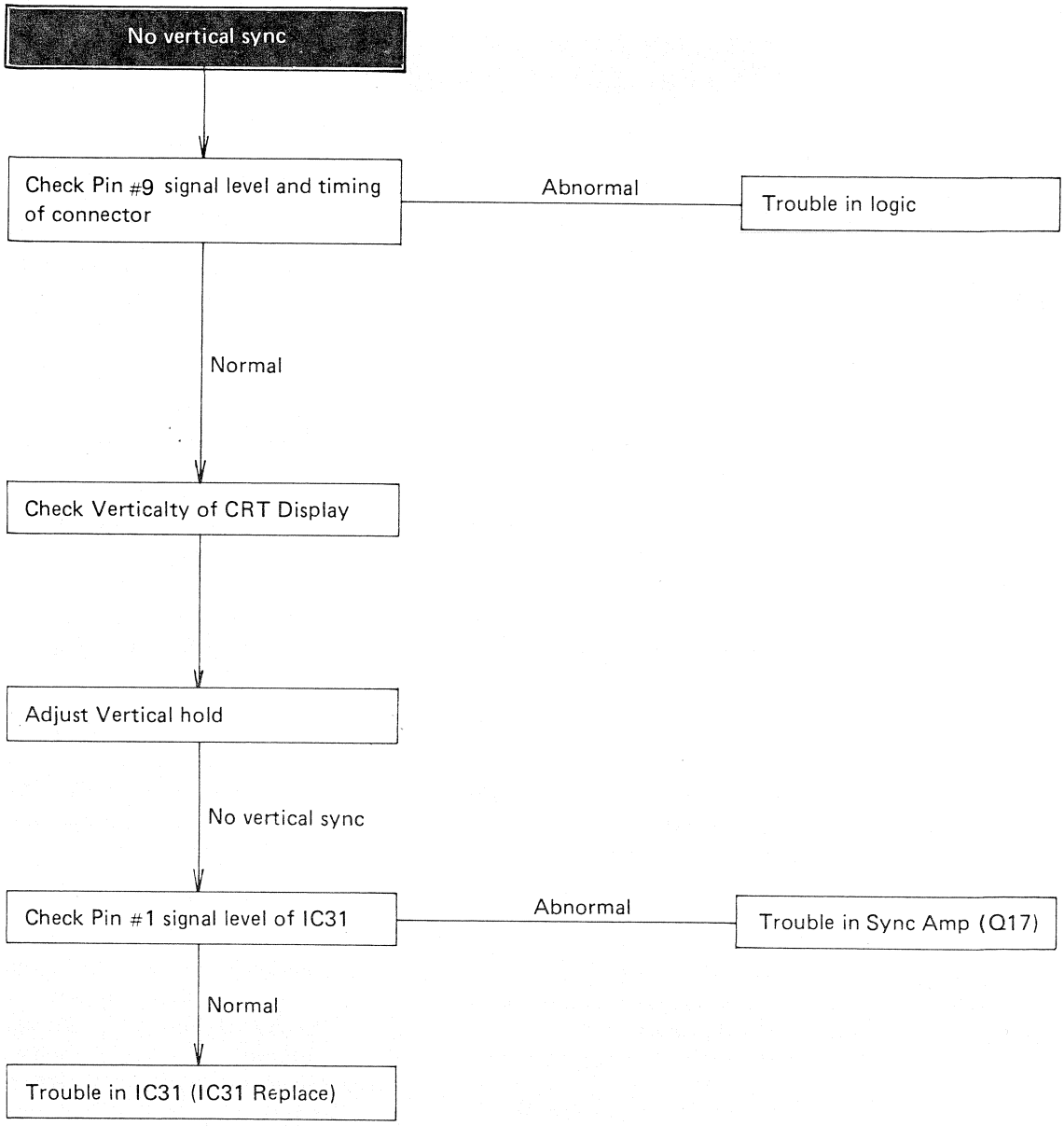


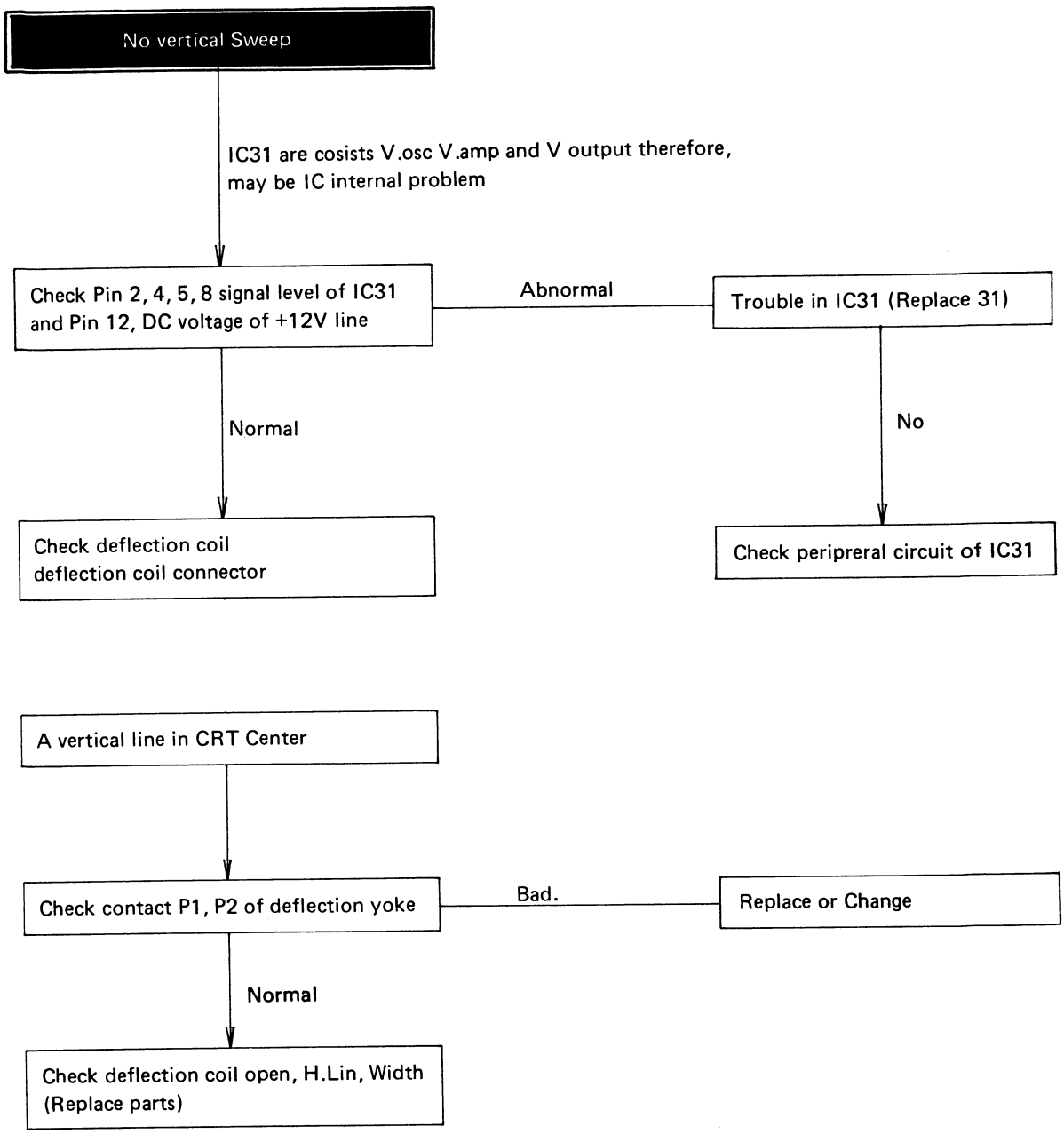
TROUBLE SHOOTING HINTS

Separate type model (M-9004NA, M-9001NA, M-9009NA, M-9009A, M-K12001NB, M-12004NB, M-K12004NB)

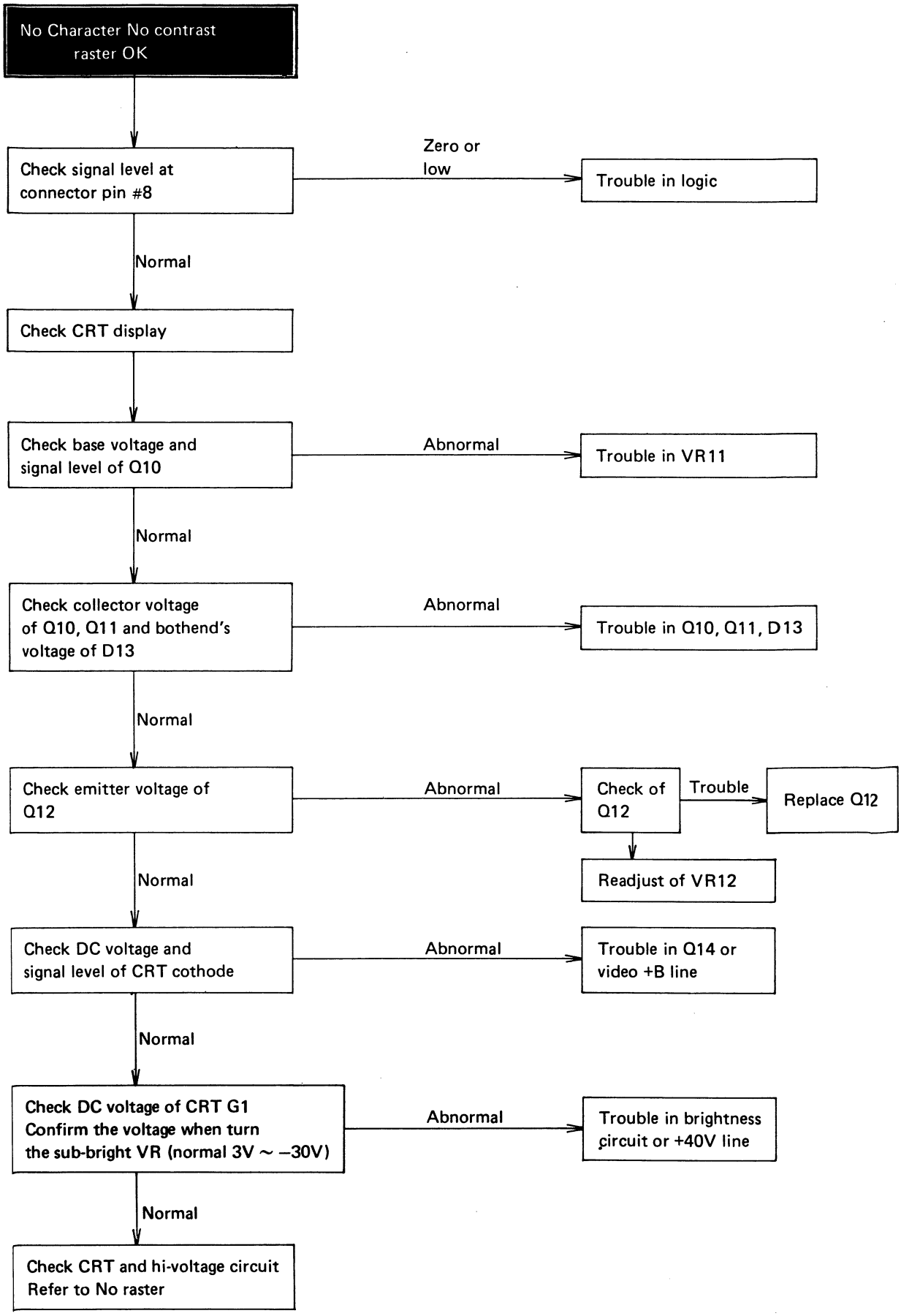

No character (Video), or No contrast raster OK
Check signal level at connector Pin #8
Zero or low
Trouble in logic or contrast control.
Normal
Check CRT Display
Check CRT Heater red?
No
+B (12V) line or CRT Heater open
Yes
Check DC voltage level of CRT Cathode.
Normal
Check DC voltage level of CRT G1
Confirm the voltage when turn the sub-bright VR (normal 3V ~ −30V)
Abnormal
Zero
No
Trouble in Video Amp.
Trouble in Video +B line
Check Brightness circuit VR or +40V line

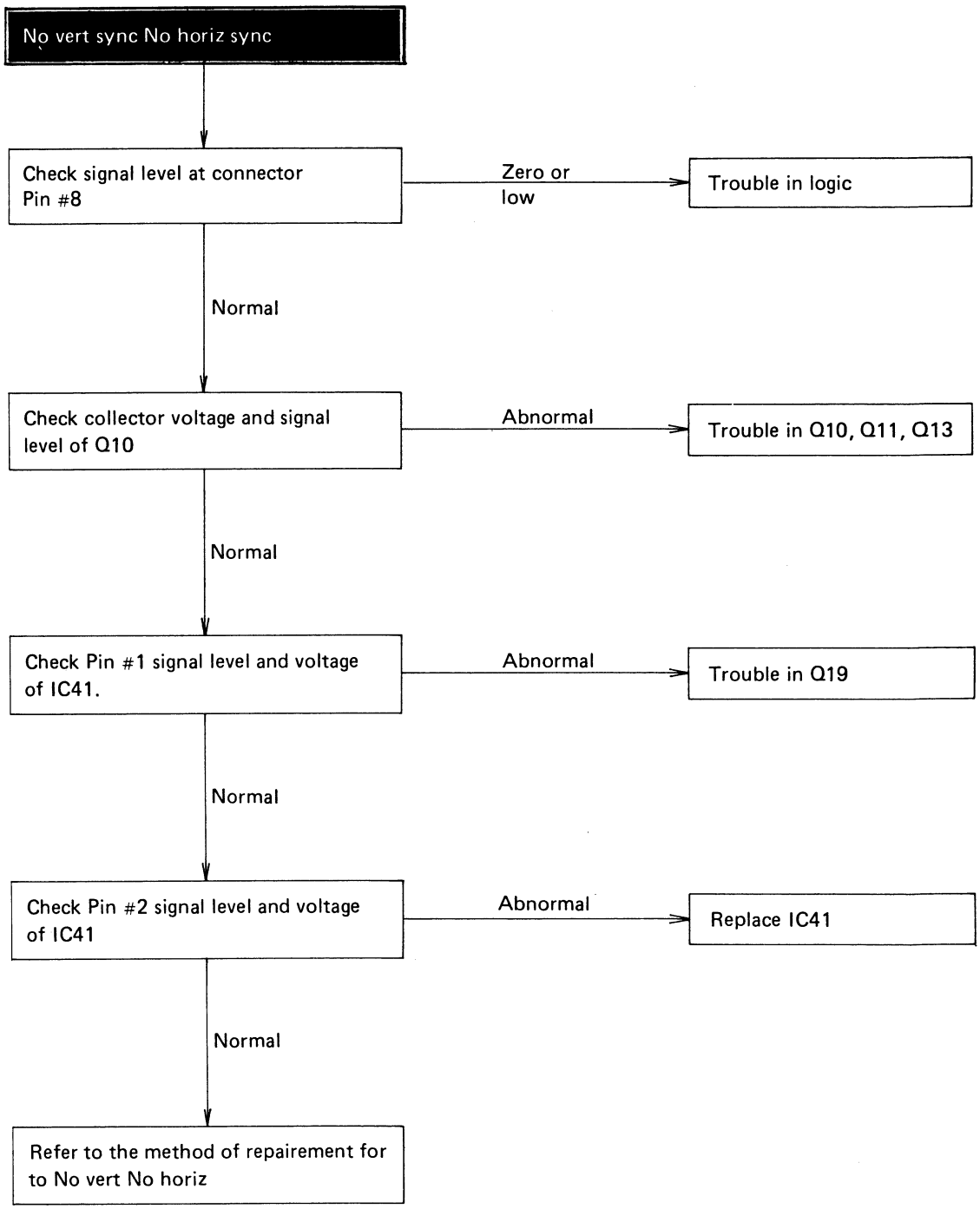

No Raster
Check Connector
Pin#6 signal level
Pin #7 voltage level
Zero or low
Trouble in logic
0V or low
Check DC voltage with no load
Normal
Check CRT Display
Normal
0V or low
Trouble in External Power Supply
Check DC Fuse 2 (A)
Open
Replace Fuse
Normal
Open
Trouble in IC42
0V or low
Check base voltage level of Q42 (H. predrive)
Disconnect the lead from Base of H.out transistor
Normal
Fuse OK
Fuse Open
Trouble in Q42, Q43 or H.Drive circuit
0V or low
Check collector voltage level of Q43 (H.drive)
Trouble in H.out transistor Q44 high voltage shorted
DC power supply shorted +B line
Normal
Trouble in H.out Q44
No
Check base or emitter of signal level of Q44 (H.out)
Normal
Trouble in high voltage circuit
Check +B line voltage of +40V. +G2

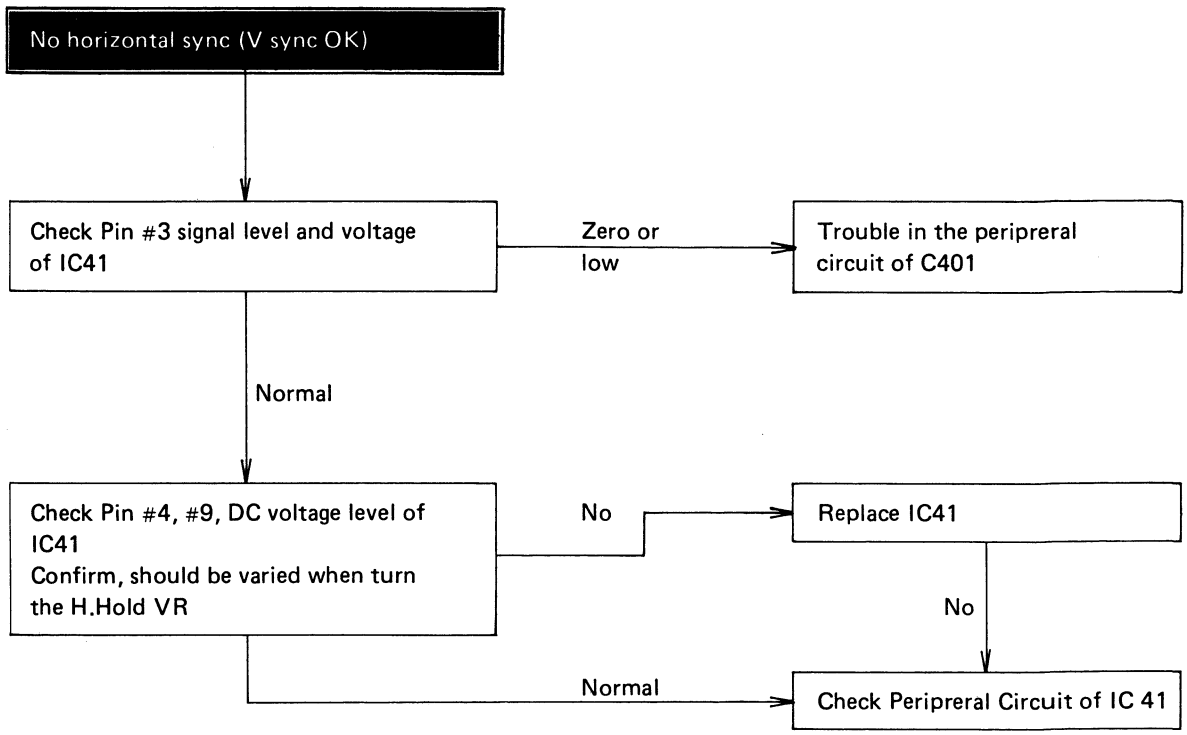

No vertical sync
Check Pin #9 signal level and timing of connector
Abnormal
Trouble in logic
Normal
Check Verticalty of CRT Display
Adjust Vertical hold
No vertical sync
Check Pin #1 signal level of IC31
Abnormal
Trouble in Sync Amp (Q17)
Normal
Trouble in IC31 (IC31 Replace)


No vertical Sweep
IC31 are cosists V.osc V.amp and V output therefore, may be IC internal problem
Check Pin 2, 4, 5, 8 signal level of IC31 and Pin 12, DC voltage of +12V line
Abnormal
Trouble in IC31 (Replace 31)
Normal
No
Check deflection coil deflection coil connector
Check peripreral circuit of IC31
A vertical line in CRT Center
Check contact P1, P2 of deflection yoke
Bad.
Replace or Change
Normal
Check deflection coil open, H.Lin, Width (Replace parts)

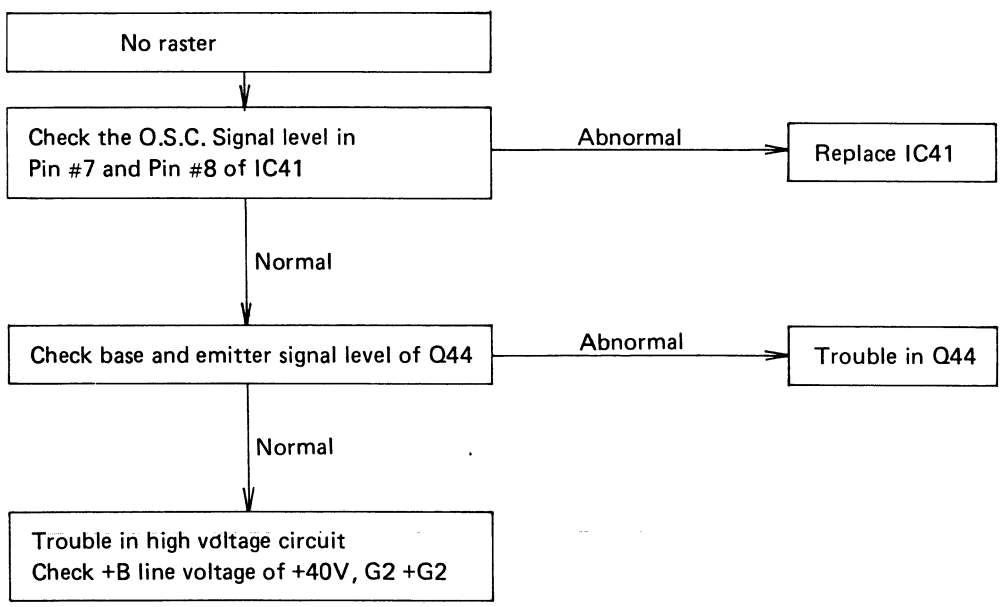
Composite type model (M-C9004N M-C12004N, M-C9001N, M-C12001N, M-C12009N)



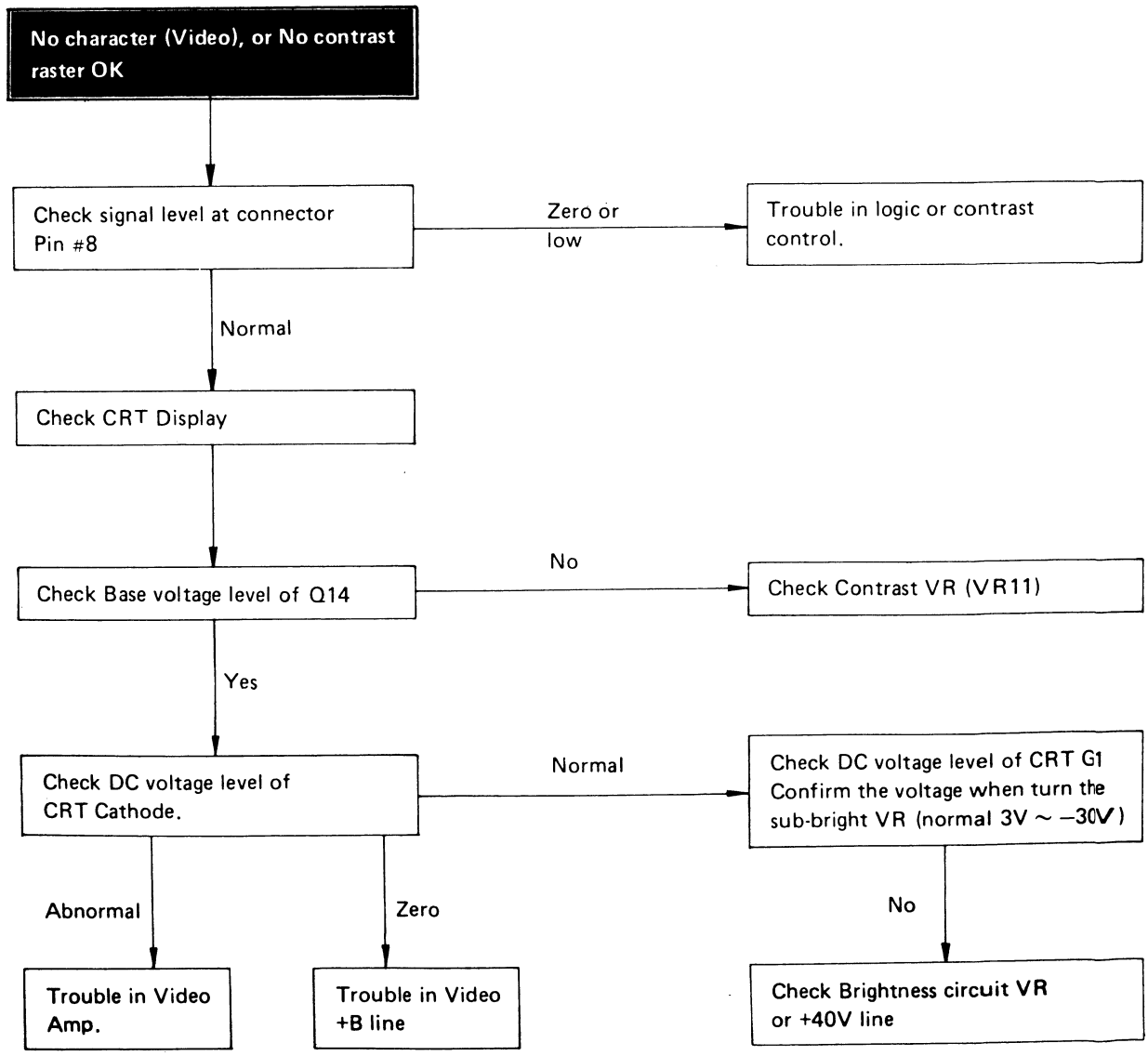

No vert sync No horiz sync
Check signal level at connector Pin #8
Zero or low
Trouble in logic
Normal
Check collector voltage and signal level of Q10
Abnormal
Trouble in Q10, Q11, Q13
Normal
Check Pin #1 signal level and voltage of IC41.
Abnormal
Trouble in Q19
Normal
Check Pin #2 signal level and voltage of IC41
Abnormal
Replace IC41
Normal
Refer to the method of repairement for to No vert No horiz

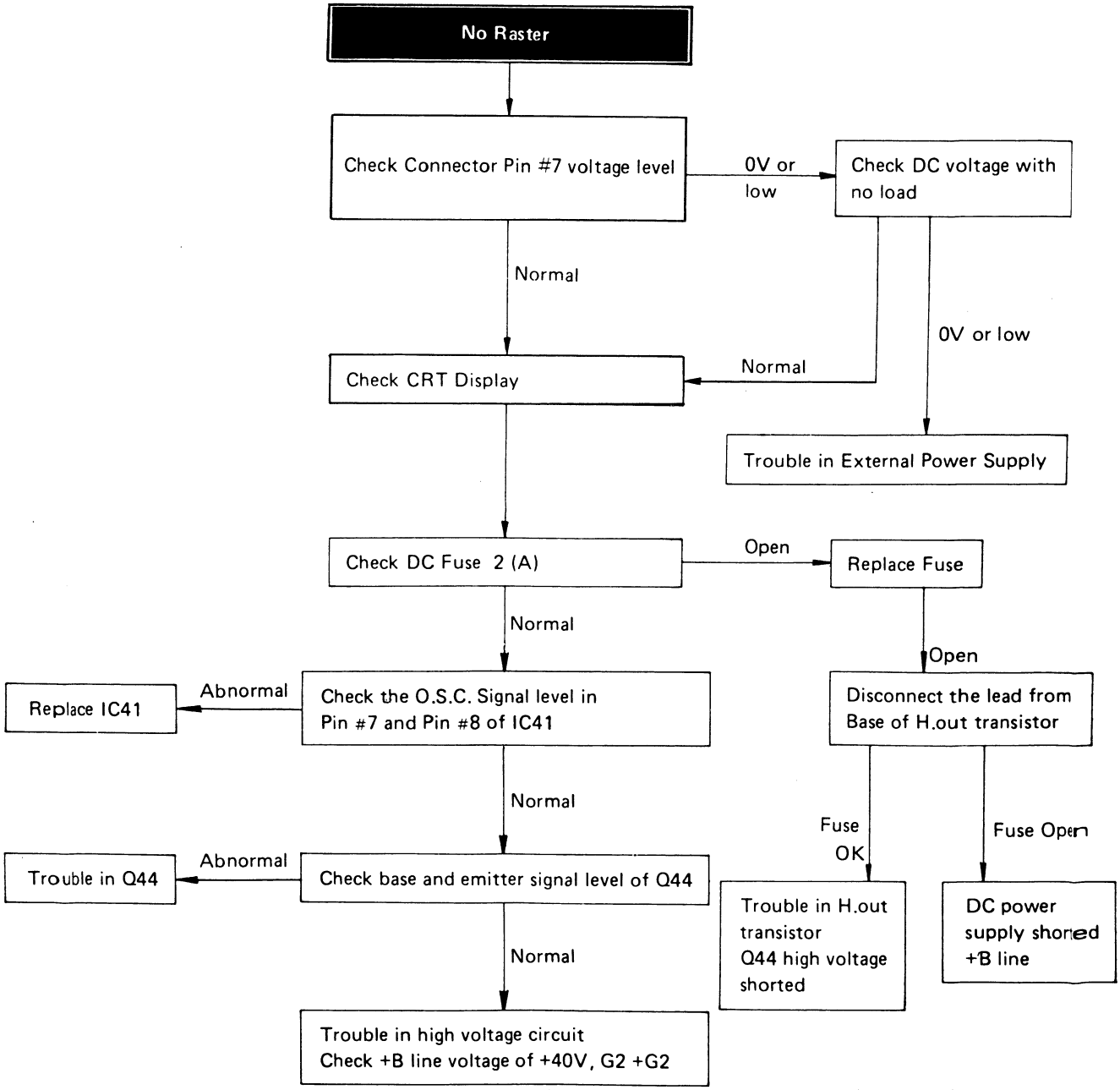

No horizontal sync (V sync OK)
Check Pin #3 signal level and voltage of IC41
Zero or low
Trouble in the peripreral circuit of C401
Normal
Check Pin #4, #9, DC voltage level of IC41
Confirm, should be varied when turn the H.Hold VR
No
Replace IC41
No
Normal
Check Peripreral Circuit of IC 41

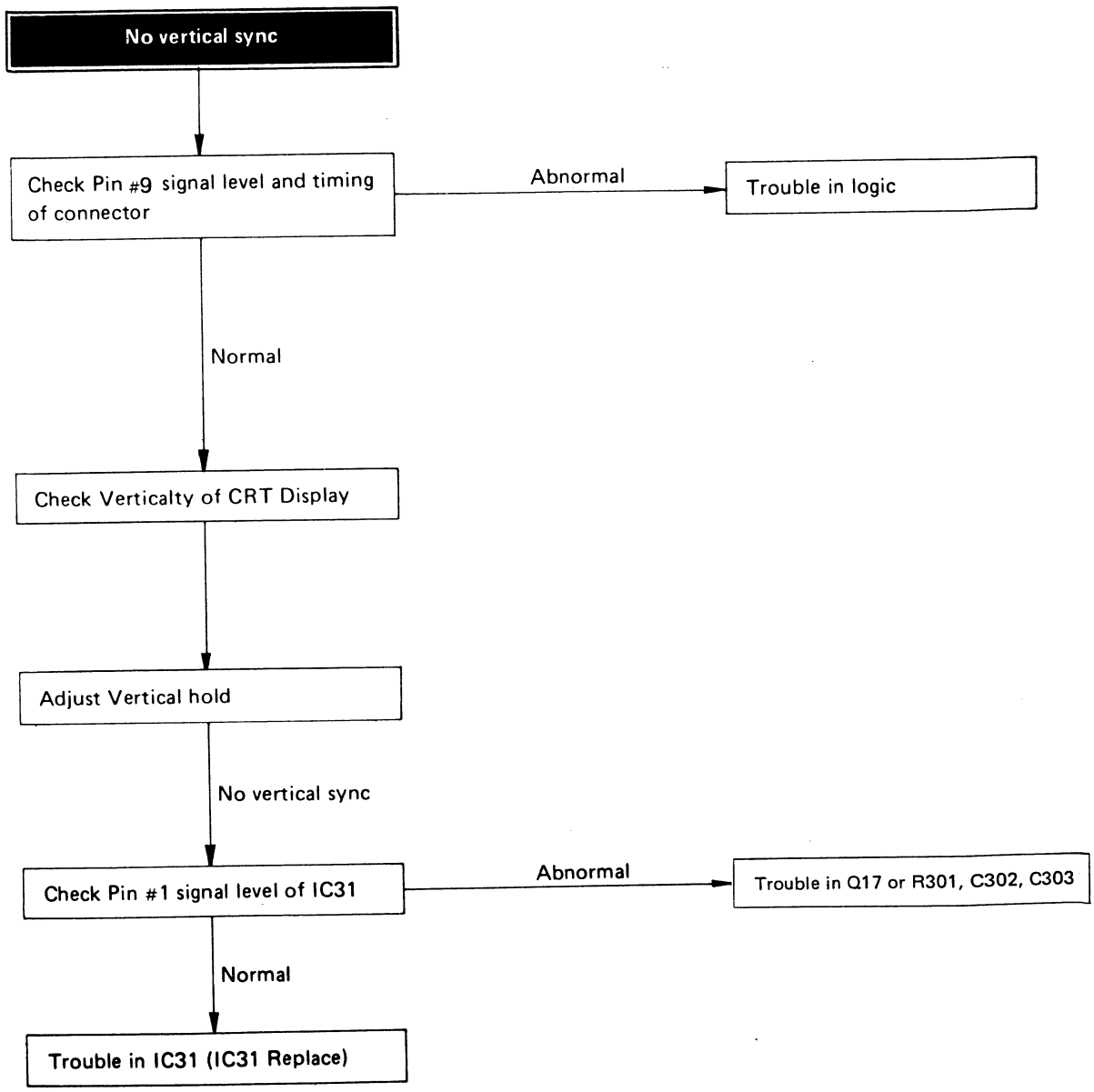
Refer to when No vert. sync, No horiz. sync

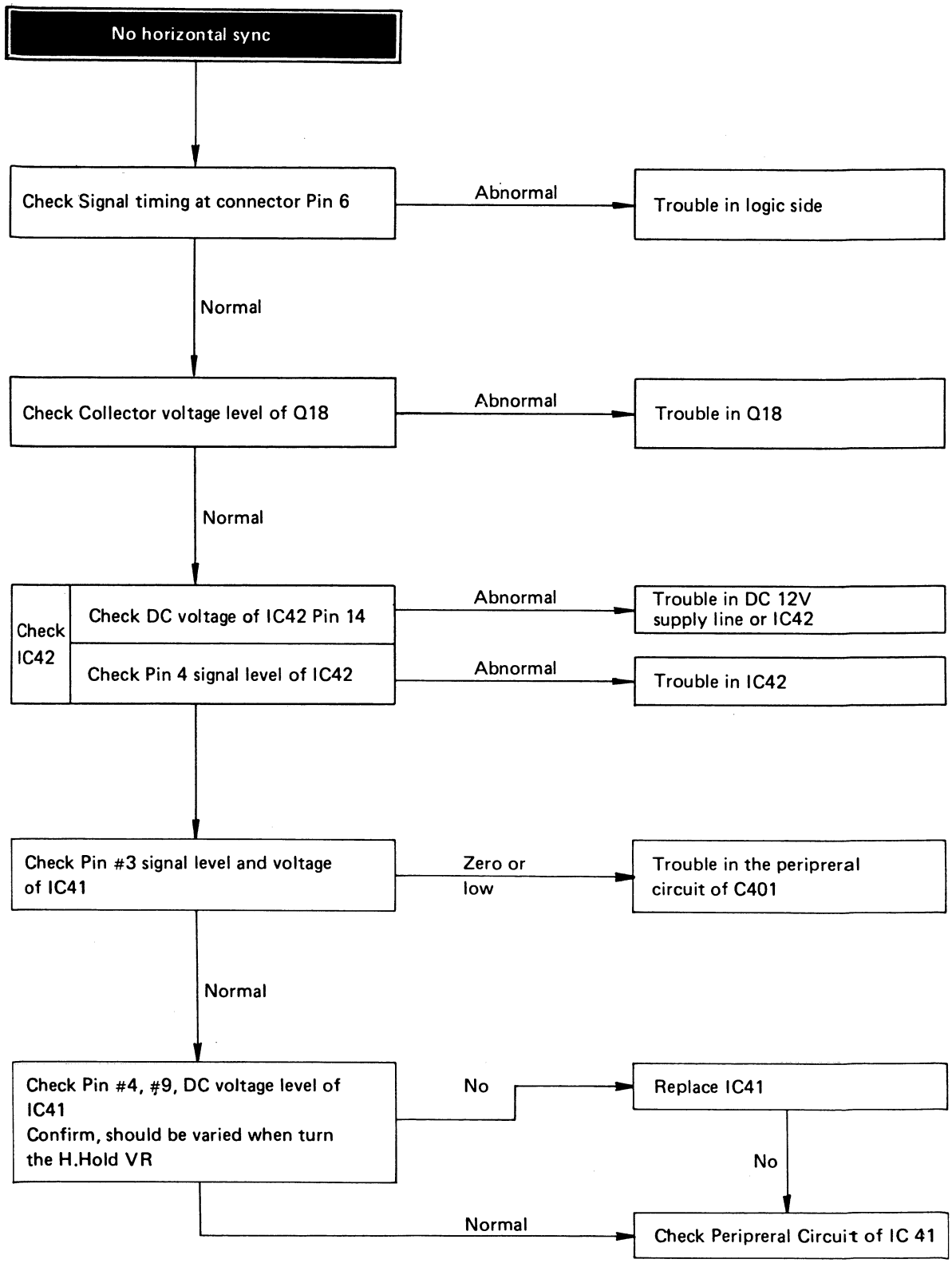

No raster
Check the O.S.C. Signal level in Pin #7 and Pin #8 of IC41
Abnormal
Replace IC41
Normal
Check base and emitter signal level of Q44
Abnormal
Trouble in Q44
Normal
Trouble in high voltage circuit
Check +B line voltage of +40V, G2 +G2

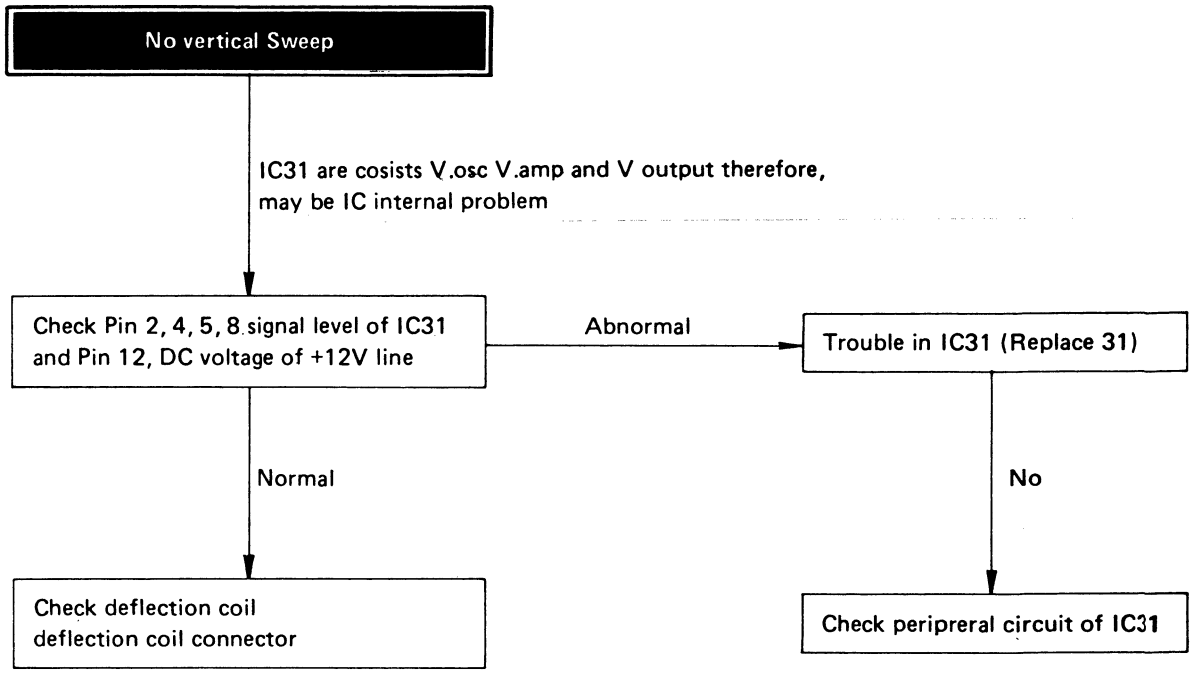
H.OSC Internal type model (M-12021PB, M-12021NB, M-12041NB)

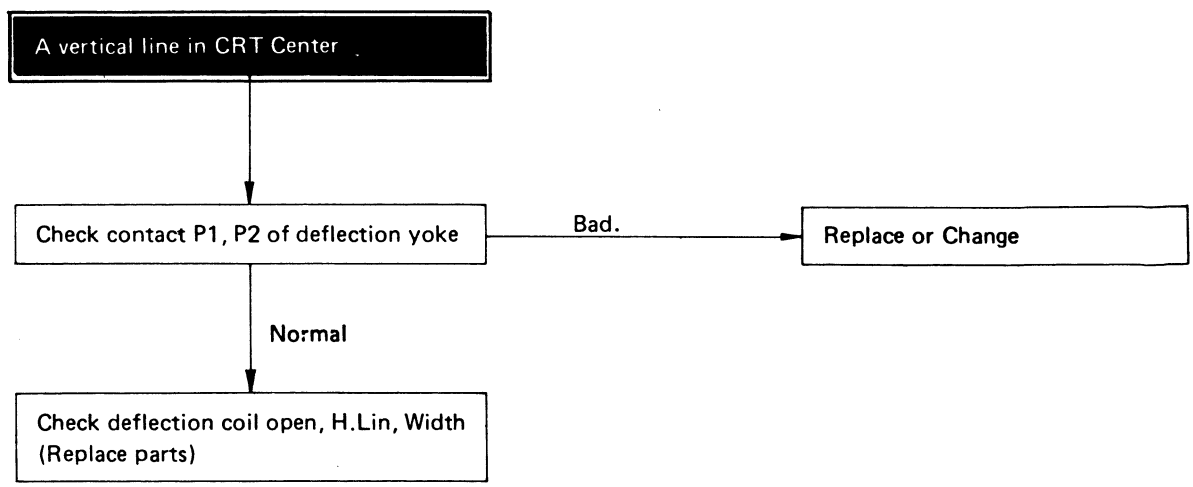

No character (Video), or No contrast raster OK
Check signal level at connector Pin #8
Zero or low
Trouble in logic or contrast control.
Normal
Check CRT Display
Check Base voltage level of Q14
No
Check Contrast VR (VR11)
Yes
Check DC voltage level of CRT Cathode.
Normal
Check DC voltage level of CRT G1 Confirm the voltage when turn the sub-bright VR (normal 3V ~ −30V)
Abnormal
Zero
No
Trouble in Video Amp.
Trouble in Video +B line
Check Brightness circuit VR or +40V line


No Raster
Check Connector Pin #7 voltage level
0V or low
Check DC voltage with no load
Normal
0V or low
Normal
Check CRT Display
Trouble in External Power Supply
Check DC Fuse 2 (A)
Open
Replace Fuse
Normal
Open
Replace IC41
Abnormal
Check the O.S.C. Signal level in Pin #7 and Pin #8 of IC41
Disconnect the lead from Base of H.out transistor
Normal
Fuse OK
Fuse Open
Trouble in Q44
Abnormal
Check base and emitter signal level of Q44
Trouble in H.out transistor Q44 high voltage shorted
DC power supply shorted +B line
Normal
Trouble in high voltage circuit
Check +B line voltage of +40V, G2 +G2


No vertical sync
Check Pin #9 signal level and timing of connector
Abnormal
Trouble in logic
Normal
Check Verticalty of CRT Display
Adjust Vertical hold
No vertical sync
Check Pin #1 signal level of IC31
Abnormal
Trouble in Q17 or R301, C302, C303
Normal
Trouble in IC31 (IC31 Replace)


No horizontal sync
Check Signal timing at connector Pin 6
Abnormal
Trouble in logic side
Normal
Check Collector voltage level of Q18
Abnormal
Trouble in Q18
Normal
Check IC42
Check DC voltage of IC42 Pin 14
Abnormal
Trouble in DC 12V supply line or IC42
Check Pin 4 signal level of IC42
Abnormal
Trouble in IC42
Check Pin #3 signal level and voltage of IC41
Zero or low
Trouble in the peripreral circuit of C401
Normal
Check Pin #4, #9, DC voltage level of IC41
Confirm, should be varied when turn the H.Hold VR
No
Replace IC41
No
Normal
Check Peripreral Circuit of IC 41


No vertical Sweep
IC31 are cosists V.osc V.amp and V output therefore, may be IC internal problem
Check Pin 2, 4, 5, 8 signal level of IC31 and Pin 12, DC voltage of +12V line
Abnormal
Trouble in IC31 (Replace 31)
Normal
No
Check deflection coil deflection coil connector
Check peripreral circuit of IC31


A vertical line in CRT Center
Check contact P1, P2 of deflection yoke
Bad.
Replace or Change
Normal
Check deflection coil open, H.Lin, Width (Replace parts)

REPLACEMENT PARTS LIST

Important Safety Notice

Components identified by the international symbol ⚠ have special characteristics important for safety.
When replacing any of these components use only manufacturer's specified parts.

Note: 1. Tolerance J: ±5% K: ±10% Z: $^{+80}_{-20}$% C: ±0.25pF

Ref. No.	Part No.	Description
		CABINET AND MAIN CHASSIS PARTS
	TUW81967	Right Side Plate W/Label
	TUW81968	Left Side Plate
	TUX80847-1	Bottom Plate
	TBM80175	Model Plate (M-9004NA only)
	TBM81842	Model Plate (M-9009A only)
	TES8143-2	CRT Grounded Spring
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	240AMB39	CRT (M-9009A only)
⚠	240AKB4N	CRT (M-9004NA only)
⚠	TLY80335A	Deflection Yoke
D46	TVSBB4	Diode
R447	ERGIANJ681	Metal Oxide 680Ω ±5% 1W
	TNP81896-21	Main PC Board
	TXAJIV4P179A	4P Connector Ass'y (DY)
	TPC816781	Outer Carton (M-9009A only)
	TQF80525	Fuse Label (Side plate L)
	TQF80759	Warning Label
	TQF80761	Service Warning Label
	TPC806231	Outer Carton (M-9004NA only)
	TXAPD1M900X	Filler Complete
	TPE84046	Set Cover
		SCREWS & WASHERS
	XTV3+15BFN	Screw (PC Board Holder)
	XTV3+8BFN	Screw (Side Plate)
	XWA38	Washer (Side Plate)
	XTB4+20BFN	Screw (CRT)
	XWA4B	Washer (CRT)
	XWG5H14	Washer (CRT)
		Model No. M-C9004N/M-C9001N
	TUW81967	Right Side Plate W/Label
	TUW81968	Left Side Plate
	TUX80847-1	Bottom Plate
	TBM80176	Model Plate (M-C9004N only)
	TBM80759	Model Plate (M-C9001N only)
	TES8143-2	CRT Grounded Spring
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	240AKB4N	CRT (M-C9004N only)
⚠	240AKB31N	CRT (M-C9001N only)
⚠	TLY80335A	Deflection Yoke
D46	TVSBB4	Diode
R447	ERGIANJ681	Metal Oxide 680Ω ±5% 1W
	TNP81896-22	Main PC Board
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TPC806241	Outer Carton (M-C9004N only)
	TPC806811	Outer Carton (M-C9001N only)
	TQF80525	Fuse Label
	TQF80759	Warning Label
	TQF80802	Service Warning Label
	TXAPD1M900X	Filler Complete
	TPE84046	Set Cover
		SCREWS & WASHERS
	XTV3+15BFN	Screw (PC Board Holder)
	XTV3+8BFN	Screw (Side Plate)
	XWA3B	Washer (Side Plate)
	XTB4+20BFN	Screw (CRT)
	XWA4B	Washer (CRT)
	XWG5H14	Washer (CRT)
		Model No. M-12004NB
	TUW81962-1H	Right Side Plate
	TUX81963-4H	Left Side Plate W/Label
	TUX80848-1H	Bottom Plate W/Label
	TUX80849	Bottom Plate Bracket (Right)
	TUX80850-1	Bottom Plate Bracket (Left)
	TBM80178	Model Plate (M-12004NB only)
	TES8143-2	CRT Grounded Spring
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	310JLB4N	CRT
⚠	TLY80336A	Deflection Yoke
D46	TVSBB4	Diode
R447	ERGIANJ681	Metal Oxide 680Ω ±5% 1W
	TNP81894-21	Main PC Board (M-12004NB only)
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TPC806301	Outer Carton (M-12004NB only)
	TXAPD1M1200X	Filler Complete
	TPE84048	Set Cover
		SCREWS & WASHERS
	XTV3+15BFN	Screw (PC Board Holder)
	XTB4+25BFN	Screw (Side Plate-Front)
	XTV3+8BFN	Screw (Side Plate)
	XTB4+8BFN	Screw (Side Plate Bracket)
	XTB4+20BFN	Screw (CRT)
	XWA3B	Washer (Side Plate-Back)
	XWA4B	Washer (CRT Side Plate-Front)
	XWG5H14	Washer
		Model No. M-C12004N/M-C12009N/M-C12001N
	TUW81962-1	Right Side Plate
	TUW81963-1	Left Side Plate W/Label
	TUX80848	Bottom Plate W/Label
	TUX80849-1	Bottom Plate Bracket (Right)

Ref. No.	Part No.	Description
	TUX80850-2	Bottom Plate Bracket (Left)
	TBM80760	Model Plate (M-C12001N only)
	TBM80788	Model Plate (M-C12009N only)
	TBM80177	Model Plate (M-C12004N only)
	TES8143-2	CRT Grounded Spring
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	310JLNB4N	CRT (M-C12004N only)
⚠	310KRB39N	CRT (M-C12009N only)
⚠	310JLB31NJ	CRT (M-C12001N only)
⚠	TLY80336A	Deflection Yoke
D46	TVSBB4	Diode
R447	ERJIANJ681	Metal Oxide 680Ω ±5% 1W
	TQF80759	Warning Label
	TQF80802	SVC Warning Label
	TQF80525	Fuse Label
	TNP81894-22	Main PC Board
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TPC806821	Outer Carton (M-C12001N only)
	TPC816001	Outer Carton (M-C12009N only)
	TPC806251	Outer Carton (M-C12004N only)
	TXAPD1M1200X	Filler Complete
	TPE84048	Set Cover

SCREWS & WASHERS

	XTV3+15BFN	Screw (PC Board Holder)
	XTB4+25BFN	Screw (Side Plate-Front)
	XTV3+8BFN	Screw (Side Plate)
	XTB4+8BFN	Screw (Side Plate Bracket)
	XTB4+20BFN	Screw (CRT)
	XWA3B	Washer (Side Plate-Back)
	XWA4B	Washer (CRT Side Plate-Front)
	XWG5H14	Washer (CRT)

Model No. M-K12004NB/M-K12001NB

	TES8177	CRT Grounded Spring
	TKS80203-1	Chassis Bracket
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	310JLB4N	CRT (M-K1200NB only)
⚠	310JLB31NJ	CRT (M-K12001NB only)
⚠	TLY80336A	Deflection Yoke
	TNP81894-23	Main PC Board
D46	YVSBB4	Diode
R447	ERJIANJ681	Metal Oxide 680Ω ±5% 1W
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TPC806162	Outer Carton (M-K12004NB)
	TPC806163	Outer Carbon (M-K12001NB)
	TXAPD1K1200	Filler Complete

SCREWS

	XTV3+12BFN	Screw (PC Board Holder)

Ref. No.	Part No.	Description

Model No. M-9001NA/M-9009NA

	TUW81967	Right Side Plate W/Label
	TUW81968	Left Side Plate
	TUX80847-1	Bottom Plate
	TBM80289	Model Plate (M-9009NA only)
	TBM80288	Model Plate (M-9001NA only)
	TES8143-2	CRT Grounded Spring
	TKX822001	PC Board Holder (Big)
	TKX822101	PC Board Holder (Small)
⚠	240AKB39N	CRT (M-9009NA only)
⚠	240AKB31N	CRT (M-9001NA only)
⚠	TLY80335A	Deflection Yoke
	TNP81896-21	Main P.C. Board
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TPE84046	Set Cover
	TPC806561	Outer Carton (M-9009NA only)
	TPC806551	Outer Carbon (M-9001NA only)
	TXAPD1M900X	Filler Complete
	TQF80525	Fuse Label (Side Plate L)
	TQF80759	Warning Label
	TQF80761	Service Warning Label

SCREW & WASHERS

	XTV3+15BFN	Screw (P.C. Board Holder)
	XTV3+8BFN	Screw (Side Plate)
	XWA3B	Washer (Side Plate)
	XTB4+20BFN	Screw (CRT)
	XWA4B	Washer (CRT)
	XWG5H14	Washer (CRT)

Model No. M-12021PB/M-12021NB

	TUW81962-1	Side Plate (Right)
	TUW81963-1	Side Plate (Left)
	TUX80849-1	Side Plate Bracket (Right)
	TUX80850-2	Side Plate Bracket (Left)
	TUX80848	Bottom Plate
		Circuit Board Holder
	TKX822001	Circuit Board Holder
	310JLB31NJ	CRT (M-12021NB only)
⚠	310JLB31J	CRT (M-12021PB only)
⚠	TLY80336A	Deflection Yoke
⚠		
	TNP81894-34	Main P.C. Board
	TBM80739	Model Plate M-12021NB
	TBM80768	Model Plate M-12021PB
	TES8143-2	CRT Grounded Spring
	TXAJTV4P179A	4P Connector Ass'y
	TPC806731	Outer Carton (M-12021NB only)
	TPC806901	Outer Carton (M-12021PB only)
	TXAPD1M1200X	Filler Complete
	TPE84048	Set Cover
	TQF80525	Fuse Label
	TQF80759	Warning Label
	TQF80802	S.V.C Warning Label

Ref. No.	Part No.	Description
	SCREWS & WASHERS	
	XTV3+15BFN	Screw (P.C. Board)
	XTV3+8BFN	Screw (Bracket)
	XTB4+20BFN	Screw (CRT)
	XTB4+25BFN	Screw (Side Plate)
	XWA4B	Washer (CRT)
	XWG5H14	Washer (CRT)
	Model No. M-12041NB	
	TUW81962-2	Side Plate (Right)
	TUW81963-2	Side Plate (Left)
	TUX80849-1	Side Bracket (Right)
	TUX80850-2	Side Bracket (Left)
	TUX80848	Bottom Plate
	TKX822101	P.C. Board Holder (Small)
	TKX822001	P.C. Board Holder (Big)
	TBM81816	Model Plate (M-12041NB)
⚠	310JLB31NJ	Picture Tube
	TNP81894-39	Main P.C. Board Ass'y
⚠	TLY80336A	Deflection Yoke
	TES8143-2	CRT Grounded Spring
	TXAJTV4P179A	4P Connector Ass'y (DY)
	TQF83825	Sirial No. Label
	TPC816661	Outer Carton (M-12041NB)
	TXAPD1M1200Z	Filler Comp.
	TPE84048	Set Cover
	TQF80759	Warning
	TQF80802	S.V.C Warning
	TQF80525	Fuse Label
	SCREWS & WASHERS	
	XTB4+20BFN	Screw (CRT)
	XTB4+25BFN	Screw (Side Plate)
	XTV3+15BFN	Screw (P.C. Board)
	XTV3+8BN	Screw (Side Plate Eash Spring)
	XWG5H14	Washer (CRT)
	XWA3B	Washer (Side Plate)
	XWA4B	Washer (CRT Side Plate)
	MAIN P.C.BOARD PARTS LIST	
	Model No. M-9001NA/M-9009NA/M-9004NA/ M-9009A TNP81896-21	
	I.C	
IC31	AN5763	V-Osc, Amp. Output
IC42	TVSMPD4011C	Phase Control
	TRANSISTROS	
Q14	2SC1360ANC	Video Amp.
Q17	2SC828AR	Vert. Inv. (Q, R)
Q42	2SC828AR	Horiz. Inv. (P, Q, R)
Q43	2SC1318R	Horiz. Drive (R, S)
Q44	2SC940-1	Horiz. Output
	DIODES	
D31	TVS10E1	Rectifier

Ref. No.	Part No.	Description
D43A ⚠	TVSBB4A	Dumper
D43B ⚠	TVSBB4A	Dumper
D44 ⚠	TVSBB10	Focus
D46	TVSBB4A	Diode
D47 ⚠	TVSS1R20	Video Rectifier
D51 ⚠	TVSBB4A	OB Rectifier
	COILS & TRANSFORMERS	
L141	TLT047-999	Peaking Coil 4.7μH
L403	TLH80710	Horiz. Width Coil
L404	TLH80619	Horiz. Lin. Coil
L405	TLP408	Choke Coil
L430 ⚠	TLH80410	Horiz. Drive Trans.
R445	TLP408	Choke Coil
T401 ⚠	TLF80837	Flyback Trans.

CAPACITORS

C143	ECCD1H221J	Ceramic	220pF	±5%	50V
C145	ECEA1JS100	Electrolytic	10μF		63V
C302	ECQM1H103JZ	Polyester	0.01μF	±5%	50V
C303	ECQM1H472JZ	Polyester	4,700pF	±5%	50V
C304	ECSZ35EFR33V	Tantalum	0.33μF		35V
C305	ECSZ16EF4R7N	Tantalum	4.7μF		16V
C306	ECSZ16EF4R7N	Tantalum	4.7μF		16V
C307	ECEA1CS100	Electrolytic	10μF		16V
C308	ECEA0JS330	Electrolytic	33μF		6.3V
C309	ECEA1CS221	Electrolytic	220μF		16V
C310	ECEA1AS102	Electrolytic	1,000μF		10V
C311	ECQM1H333JZ	Polyester	0.033μF	±5%	50V
C312	ECEA1CS471	Electrolytic	470μF		16V
C423	ECEA1CS331	Electrolytic	330μF		16V
C430	ECQM1H153JZ	Polyester	0.015μF	±5%	50V
C441 ⚠	ECKD2H102KB2	Ceramic	1,000pF	±10%	500V
C442 ⚠	ECQM4223KZ	Polyester	0.022μF	±10%	400V
C443 ⚠	ECQM4223KZ	Polyester	0.022μF	±10%	400V
C444 ⚠	ECEA25W12ZE	Electrolytic	12μF		25V
C460 ⚠	ECQE6104KZ	Polyester	0.1μF	±10%	600V
C461 ⚠	ECEA1JS101	Electrolytic	100μF		63V
C463	ECEA350V3R3	Electrolytic	3.3μF		350V
C465	ECEA350VR47	Electrolytic	0.47μF		350V
C491 ⚠	ECEA1CS102	Electrolytic	1,000μF		16V
C493	ECQM1H472JZ	Polyester	4,700pF	±5%	50V
C494	ECCD1H271J	Ceramic	270pF	±5%	50V
C496	ECEA0JS101	Electrolytic	100μF		6.3V
C497	ECCD1H221J	Ceramic	220pF	±5%	50V
C602	ECKD2H102KB2	Ceramic	1,000pF	±10%	500V
C705	ECEA1CS222	Electrolytic	2,200μF		16V

RESISTORS

R143	ERD25TJ470	Carbon	47Ω	±5%	¼W
R144	ERD25TJ470	Carbon	47Ω	±5%	¼W
R146	ERD25TJ820	Carbon	82Ω	±5%	¼W
R151	ERG2ANJ821	Metal Oxide	820Ω	±5%	2W
R161B	ERD25TJ102	Carbon	1KΩ	±5%	¼W
R170	ERD25TJ103	Carbon	10KΩ	±5%	¼W
R171	ERD25TJ103	Carbon	10KΩ	±5%	¼W

Ref. No.	Part No.	Description		
R172	ERD25TJ562	Carbon	5.6KΩ ±5%	¼W
R301	ERD25TJ392	Carbon	3.9KΩ ±5%	¼W
R302	ERD25TJ683	Carbon	68KΩ ±5%	¼W
R303	ERD25FJ6R8	Carbon	6.8Ω ±5%	¼W
R304	ERD25FJ1R1	Carbon	1.1Ω ±5%	¼W
R305	ERD25TJ683	Carbon	68KΩ ±5%	¼W
R306	ERD25FJ6R8	Carbon	6.8Ω ±5%	¼W
R307	ERD25TJ4R7	Carbon	4.7Ω ±5%	¼W
R310	ERD25TJ153	Carbon	15KΩ ±5%	¼W
R423 ⚠	ERD25FJ680	Carbon	68Ω ±5%	¼W
R431	ERD25TJ221	Carbon	220Ω ±5%	¼W
R432 ⚠	TRF2SJ100	Non Flame	10Ω ±5%	2W
R433	ERD25TJ471	Carbon	470Ω ±5%	¼W
R441 ⚠	ERD25FJ6R8	Carbon	6.8Ω ±5%	¼W
R443	ERD25FJ122	Carbon	1.2KΩ ±5%	¼W
R444 ⚠	ERD25TJ122	Carbon	1.2KΩ ±5%	¼W
R447	ERG1ANJ681	Metal Oxide	680Ω ±5%	1W
R460 ⚠	ERD14FJ102	Carbon	1KΩ ±5%	¼W
R461 ⚠	ERD25FJ6R8	Carbon	6.8Ω ±5%	¼W
R465	ERD25TJ334	Carbon	330KΩ ±5%	¼W
R472	ERG1ANJ104	Metal Oxide	100KΩ ±5%	1W
R491	ERD25TJ273	Carbon	27KΩ ±5%	¼W
R492	ERD25TJ822	Carbon	8.2KΩ ±5%	¼W
R493	ERD25TJ682	Carbon	6.8KΩ ±5%	¼W
R494	ERD25TJ681	Carbon	680Ω ±5%	¼W
R495	ERD25TJ122	Carbon	1.2KΩ ±5%	¼W
R496	ERD25TJ103	Carbon	10KΩ ±5%	¼W
R601	ERC12GJ561	Solid	560Ω ±5%	½W
R602 ⚠	ERD25FJ103	Carbon	10KΩ ±5%	¼W
R605 ⚠	ERD25FJ103	Carbon	10KΩ ±5%	¼W
R606 ⚠	ERD25FJ103	Carbon	10KΩ ±5%	¼W
J495	ERD25TJ103	Carbon	10KΩ ±5%	¼W

CONTROLS

VR31	EVTS3AA00B15	Vert. Hodl	100KΩB
VR32	EVTS3AA00B54	Vert. Height	50KΩB
VR33	EVTS3AA00B14	Vert. Lin.	10KΩB
VR64	EVM81U10KB26	Focus	2MΩB
VR67	EVTS3AA00B25	Sub. Bright	200KΩB

OTHER PARTS S

SF1,3	TJC305-1	Fuse Holder	
	TJS25640V	CRT Socket	
	TMK81516	CRT Cover	
	TMM81434	Revet	
⚠	XBA1F20NU14	Fuse	2.0A

Model No. M-12004NB
TNP81894-21

I.C

IC31	AN5763	V-Osc, Amp. Output
IC42	TVSMPD4011C	Phase Control

TRANSISTORS

Q14	2SC1360ANC	Video Amp.	
Q17	2Sc828AR	Vert. Inv.	(Q, R)
Q42	2SC828AR	Horiz. Inv.	(P, Q, R)
Q43	2SC1318R	Horiz. Drive	(R, S)
Q44	2SC940-1	Horiz. Output	

DIODES

D31	TVS10E1	Rectifier
D43A ⚠	TVSBB4A	Dumper
D43B ⚠	TVSBB4A	Dumper
D44 ⚠	TVSBB10	Focus
D47 ⚠	TVSS1R20	Video Rectifier
D49A ⚠	TVSBB2A	Boost
D49B ⚠	TVSBB2A	Boost
D51 ⚠	TVSBB4A	Recifier

COILS & TRANSFORMERS

L141	TLT047-999	Peaking Coil	4.7μH
L403 ⚠	TLH80704	Horiz. Width Coil	
L404 ⚠	TLH80608	Horiz. Lin. Coil	
L405	TLP408	Choke Coil	
L430 ⚠	TLH80410	Horiz. Drive Trans.	
R445	TLP408	Choke Coil	
T401 ⚠	TLF80838	Flyback Trans.	

CAPACITORS

C143	ECCD1H221J	Ceramic	220pF ±5%	50V
C145	CEEA1JS100	Electrolytic	10μF	63V
C302	ECQM05103JZ	Polyester	0.01μF ±5%	50V
C303	ECQM05472JZ	Polyester	4,700pF ±5%	50V
C304	ECSZ35EFR33V	Tantalum	0.33μF	35V
C305	ECSZ16EF4R7N	Tantalum	4.7μF	16V
C306	ECSZ16EF4R7N	Tantalum	4.7μF	16V
C307	ECEA1CS100	Electrolytic	10μF	16V
C308	ECEA0JS330	Electrolytic	33μF	6.3V
C309	ECEA1CS221	Electrolytic	220μF	16V
C310	ECEA1AS102	Electrolytic	1,000μF	10V
C311	ECQM05333JZ	Polyester	0.033μF ±5%	50V
C312	ECEA1CS471		470μF	16V
C423	ECEA1CS331	Electrolytic	330μF	16V
C430	ECQM05153JZ	Polyester	0.015μF ±5%	50V
C441 ⚠	ECKD2H821KB9	Ceramic	820pF ±10%	500V
C442 ⚠	ECQM6153KZ	Polyester	0.015μF ±10%	600V
C444 ⚠	ECEA25W8R5Z	Electrolytic	8.5μF	25V
C460 ⚠	ECQE10473KZ	Polyester	0.047μF ±10%	1KV
C461 ⚠	ECEA1JS101	Electrolytic	100μF	63V
C463	ECEA350V3R3	Electrolytic	3.3μF	350V
C465	ECEA350VR47	Electrolytic	0.47μF	350V
C491 ⚠	ECEA1CS102	Electrolytic	1,000μF	16V
C493	ECQM05472JZ	Polyester	4,700pF ±5%	50V
C494	ECCD1H271J	Ceramic	270pF ±5%	50V
C496	ECEA0JS101	Electrolytic	100μF	6.3V
C497	ECCD1H221J	Ceramic	220pF ±5%	50V
C602	ECKD2H102KB2	Ceramic	1,000pF ±10%	500V
C705	ECEA1CS222	Electrolytic	2,200μF	16V

RESISTORS

R143	ERD25TJ470	Carbon	47Ω ±5%	¼W
R144	ERD25TJ470	Carbon	47Ω ±5%	¼W

Ref. No.	Part No.	Description			
R151	ERG2ANJ821	Metal Oxide	820Ω	±5%	2W
R161B	ERD25TJ102	Carbon	1KΩ	±5%	¼W
R170	ERD25TJ103	Carbon	10KΩ	±5%	¼W
R171	ERD25TJ103	Carbon	10KΩ	±5%	¼W
R172	ERD25TJ562	Carbon	5.6KΩ	±5%	¼W
R301	ERD25TJ392	Carbon	3.9KΩ	±5%	¼W
R302	ERD25TJ683	Carbon	68KΩ	±5%	¼W
R303 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5%	¼W
R304 ⚠	ERD25FJ1R1	Carbon	1.1Ω	±5%	¼W
R305	ERD25TJ563	Carbon	56KΩ	±5%	¼W
R306 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5%	¼W
R307	ERD25TJ4R7	Carbon	4.7Ω	±5%	¼W
R310	ERD25TJ153	Carbon	15KΩ	±5%	¼W
R423 ⚠	ERD25FJ680	Carbon	68Ω	±5%	¼W
R431	ERD25TJ222	Carbon	2.2KΩ	±5%	¼W
R432 ⚠	TRF2SJ100	Non Flame	10Ω	±5%	2W
R433	ERD25TJ471	Carbon	470Ω	±5%	¼W
R441 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5%	¼W
R442 ⚠	TRF2SKR47	Non Flame	0.47Ω	±10%	2W
R443 ⚠	ERD25FJ122	Carbon	1.2KΩ	±5%	¼W
R444	ERD25TJ122	Carbon	1.2KΩ	±5%	¼W
R460 ⚠	ERD14FJ102	Carbon	1KΩ	±5%	¼W
R461 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5%	¼W
R465	ERD25TJ274	Carbon	270KΩ	±5%	¼W
R466	ERD25TJ333	Carbon	33KΩ	±5%	¼W
R468	ERD25TJ105	Carbon	1MΩ	±5%	¼W
R472	ERG1ANJ104	Metal Oxide	100KΩ	±5%	2W
R491	ERD25TJ273	Carbon	27KΩ	±5%	¼W
R492	ERD25TJ822	Carbon	8.2KΩ	±5%	¼W
R493	ERD25TJ682	Carbon	6.8KΩ	±5%	¼W
R494	ERD25TJ681	Carbon	680Ω	±5%	¼W
R495	ERD25TJ122	Carbon	1.2KΩ	±5%	¼W
R496	ERD25TJ103	Carbon	10KΩ	±5%	¼W
R601	ERC12GJ561	Solid	560Ω	±5%	½W
R602 ⚠	ERD25FJ103	Carbon	10KΩ	±5%	¼W
R605 ⚠	ERD25FJ103	Carbon	10KΩ	±5%	¼W
R606 ⚠	ERD25FJ103	Carbon	10KΩ	±5%	¼W
J495	ERD25TJ103	Carbon	10KΩ	±5%	¼W

CONTROLS

VR31	EVTS3AA00B15	Vert. Hold	100KΩB
VR32	EVTS3AA00B54	Vert. Height	50KΩB
VR33	EVTS3AA00B14	Vert. Lin.	10KΩB
VR64	EVM81U10KB26	Focus	2MΩB
VR67	EVTS3AA00B25	Sub. Bright	200KΩB

OTHER PARTS

SF1,3	TJC305-1	Fuse Holder	
	TJS25640V	CRT Socket	
	TMK81516	CRT Cover	
	TMM81434	Revet	
⚠	XBA1F20NU14	Fuse	2.0A

Ref. No.	Part No.	Description

Model No. M-C12001N/M-C12004N/M-C12009N
TNP81894-22 MAIN P.C. BOARD

I.C

IC31	AN5763	I.C
IC41	AN5753	I.C

TRANSISTORS

Q10	2SC829C	Transistor
Q11	2SC829C	Transistor
Q12	2SC829C	Transistor
Q14	2SC1360ANC	Transistor
Q19	2SC828AQ	Transistor
Q44	2SC901BN	Transistor

DIODES

D12	MA150	Diode
D13	TVSRD3R9EB2	Diode
D31	TVS10E1	Diode
D32	MA150	Diode
D43A ⚠	TVSBB4A	Diode
D43B ⚠	TVSBB4A	Diode
D44 ⚠	TVS2DL15	Diode
D45	MA150	Diode
D46	TVSBB4	Diode
D47 ⚠	TVSS1R20	
D49A ⚠	TVSBB2A	Diode
D49B ⚠	TVSBB2A	Diode
D51 ⚠	TVSBB4	Diode

COILS & TRANSFORMERS

L121	TLT047-999	Peaking Coil	0.47μH
L122	TLP408	Choke Coil	
L141	TLT047-999	Peaking Coil	0.47μH
L403 ⚠	TLH80704	Width Coil	
L404 ⚠	TLH80608	H. Lin. Coil	
L405	TLP408	Choke Coil	
L430 ⚠	TLH80410	H. Drive Trans.	
J124	TLT821-999	Peaking Coil	820μH
T401 ⚠	TLF80838	Flyback Trans.	

RESISTORS

R121	ERD25TJ820	Carbon	82Ω	J	¼W
R122	ERD25TJ821	Carbon	820Ω	J	¼W
R123	ERD25TJ820	Carbon	82Ω	J	¼W
R124	ERD25TJ821	Carbon	820Ω	J	¼W
R125	ERD25TJ102	Carbon	1KΩ	J	¼W
R126	ERD25TJ820	Carbon	82Ω	J	¼W
R127	ERD25TJ181	Carbon	180Ω	J	¼W
R128	ERD25TJ562	Carbon	5.6KΩ	J	¼W
R129	ERD25TJ122	Carbon	1.2KΩ	J	¼W
R131	ERD25TJ563	Carbon	56KΩ	J	¼W
R132	ERD25TJ332	Carbon	3.3KΩ	J	¼W
R133	ERD25TJ271	Carbon	270Ω	J	¼W
R143	ERD25TJ470	Carbon	47Ω	J	¼W
R144	ERD25TJ220	Carbon	22Ω	J	¼W
R146	ERD25TJ820	Carbon	82Ω	J	¼W

Ref. No.	Part No.	Description			
R151	ERG2ANJ821	Metal Oxide	820Ω	J	2W
R161A	ERD25TJ151	Carbon	150Ω	J	¼W
R173	ERD25TJ122	Carbon	1.2KΩ	J	¼W
R300	ERD25TJ153	Carbon	15KΩ	J	¼W
R301	ERD25TJ472	Carbon	4.7KΩ	J	¼W
R302	ERD25TJ683	Carbon	68KΩ	J	¼W
⚠ R303	ERD25FJ6R8	Carbon	6.8Ω	J	¼W
⚠ R304	ERD25FJ1R1	Carbon	1.1Ω	J	¼W
R305	ERD25TJ563	Carbon	56KΩ	J	¼W
⚠ R306	ERD25FJ6R8	Carbon	6.8Ω	J	¼W
R307	ERD25TJ4R7	Carbon	4.7Ω	J	¼W
R308	ERD25TJ331	Carbon	330Ω	J	¼W
R309	ERD25TJ331	Carbon	330Ω	J	¼W
R310	ERD25TJ153	Carbon	15KΩ	J	¼W
R401	ERD25TJ333	Carbon	33KΩ	J	¼W
R402	ERD25TJ332	Carbon	3.3KΩ	J	¼W
R403	ERD25TJ273	Carbon	27KΩ	J	¼W
R404	ERO25CKG2701	Metal Oxide	2.7KΩ	G	¼W
⚠ R423	ERD25FJ680	Carbon	68Ω	J	¼W
⚠ R432	TRF2SJ100	Non Flame	10Ω	J	2W
⚠ R441	ERD25FJ6R8	Carbon	6.8Ω	J	¼W
⚠ R442	TRF2SKR47	Non Flame	0.47Ω	K	2W
⚠ R443	ERD25FJ122	Carbon	1.2KΩ	J	¼W
R444	ERD25TJ122	Carbon	1.2KΩ	J	¼W
R445	TLP408	Hoke Coil			
R447	ERG1ANJ681	Metal Oxide	680Ω	J	1W
⚠ R460	ERD14FJ102	Carbon	1KΩ	J	¼W
⚠ R461	ERD25FJ6R8	Carbon	6.8Ω	J	¼W
R465	ERD25TJ274	Carbon	270KΩ	J	¼W
R466	ERD25TJ333	Carbon	33KΩ	J	¼W
R468	ERD25TJ105	Carbon	1MΩ	J	¼W
R470	ERD25TJ102	Carbon	1KΩ	J	¼W
R472	ERG1ANJ104	Metal Oxide	100KΩ	J	1W
R601	ERC12GJ561	Solid	560Ω	J	½W
⚠ R602	ERD25FJ103	Carbon	10KΩ	J	¼W
⚠ R605	ERD25FJ103	Carbon	10KΩ	J	¼W
⚠ R606	ERD25FJ103	Carbon	10KΩ	J	¼W

CAPACITORS

C121	ECEA1CN470SE	Electrolytic	47μF		16V
C122	ECEA0JS470	Electrolytic	47μF		6.3V
C123	ECKD1H103PF2	Ceramic	0.01μF	P	50V
C124	ECEA1ES4R7	Electrolytic	4.7μF		25V
C125	ECEA1CS220	Electrolytic	22μF		16V
C126	ECCD1H220JC2	Ceramic	22pF	J	50V
C127	ECEA1CS101	Electrolytic	100μF		16V
C143	ECCD1H181JC	Ceramic	180pF	J	50V
C145	ECEA1JS100	Electrolytic	10μF		63V
C161	ECEA1ES4R7	Electrolytic	4.7μF		25V
C301	ECQM1H223JZ	Polyester	0.022μF	J	50V
C302	ECQM1H223JZ	Polyester	0.022μF	J	50V
C303	ECQM1H103JZ	Polyester	0.01μF	J	50V
C304	ECSZ35EFR33V	Tantalum	0.33μF		35V
C305	ECSF16E4R7Z	Tantalum	4.7μF		16V
C306	ECSF16E4R7Z	Tantalum	4.7μF		16V

Ref. No.	Part No.	Description			
C307	ECEA1CS100	Electrolytic	10μF		16V
C308	ECEA0JS330	Electrolytic	33μF		6.3V
C309	ECEA1CS221	Electrolytic	220μF		16V
C310	ECEA1AS102	Electrolytic	1,000μF		10V
C311	ECQM1H333JZ	Polyester	0.033μF	J	50V
C312	ECEA1CS471	Electrolytic	470μF		16V
C401	ECQM1H183JZ	Polyester	0.018μF	J	50V
C402	ECQM1H153JZ	Polyester	0.015μF	J	50V
C403	ECQM1H103JZ	Polyester	0.01μF	J	50V
C404	ECEA1ES4R7	Electrolytic	4.7μF		25V
C405	ECQS1392JWT	Styrol	3900pF	J	100V
C406	ECQM1H102JZ	Polyester	1000pF	J	50V
C407	ECCD2H220K	Ceramic	22pF	K	500V
C423	ECEA1CS331	Electrolytic	330μF		16V
C430	ECQM1H153JZ	Polyester	0.015μF	J	50V
⚠ C441	ECKD2H821KB9	Ceramic	820pF	K	500V
⚠ C442	ECQM6153KZ	Polyester	0.015μF	K	600V
⚠ C444	ECEA25W8R5Z	Electrolytic	8.5μF		25V
C445	ECEA50V100Y	Electrolytic	10μF		50V
⚠ C460	ECQE10473KZ	Polyester	0.047μF	K	
⚠ C461	ECEA1JS101	Electrolytic	100μF		63V
C463	ECEA2VS3R3Y	Electrolytic	3.3μF		350V
C465	ECEA2VSR47Y	Electrolytic	0.47μF		350V
⚠ C491	ECEA1CS102	Electrolytic	1000μF		16V
C602	ECKD2H102KB2	Ceramic	1000pF	K	500V
C705	ECEA1CS222	Electrolytic	2200μF		16V

OTHER PARTS

	TJS25640V	CRT Socket	
	TMK81516	CRT P.C. Board Cover	
	TMM81434	Rivet	
⚠	XBA1F20NU14	Fuse	2A
SF1,3	TJC305-1	Fuse Holder	

CONTROLS

VR11	EVTS3MA00B52	Sub. Contrast Control	500Ω B
VR12	EVNK4AA00B13	Pedestal Level Control	1KΩB
VR31	EVTS3AA00B15	V. Hold Control	100KΩB
VR32	EVTS3MA00B54	Height Control	50KΩB
VR33	EVTS3MA00B14	V Lin. Control	10KΩB
VR41	EVTS3MA00B13	H. Hold Control	1KΩB
VR64	EVT81US10B26	Focus	2MΩB
VR67	EVLS3JA00B25	Control	200KΩB

Model No. M-K12001NB/M-K12004NB
TNP81894-23

I.C

IC31	AN5763	I.C	
IC42	TVSMPD4011C	I.C	

TRANSISTORS

Q14	2SC1360ANC	Transistor	
Q17	2SC828AR	Transistor	(Q, R)
Q42	2SC828AR	Transistor	(P, Q)
Q43	2SC1318-R	Transistor	(R, S)
Q44	2SC940-1	Transistor	

Ref. No.	Part No.	Description
DIODES		
D31	TVS10E1	Rectifier
D43A ⚠	TVSBB4A	Dumper
D43B ⚠	TVSBB4A	Dumper
D44 ⚠	TVS2DL15	Focus
D47 ⚠	TVSS1R20	Video Rectifier
D49A ⚠	TVSBB2A	Boost
D49B ⚠	TVSBB2A	Boost
D51 ⚠	TVSBB4A	Rectifier
COILS & TRANSFORMERS		
L141	TLT047-999	Peaking Coil 0.47μH
L403 ⚠	TLH80704	Horiz. Width Coil
L404 ⚠	TLH80608	Horiz. Lin. Coil
L405	TLP408	Choke Coil
L430 ⚠	TLH80410	Horiz. Drive Trans.
T401 ⚠	TLF80838	Flyback Trans.
R445	TLP408	Choke Coil

Ref. No.	Part No.	Description		
CAPACITORS				
C143	ECCD1H221J	Ceramic 220pF		50V
C145	ECEA1JS100	Electrolytic 10μF		63V
C302	ECQM1H103JZ	Polyester 0.01μF		50V
C303	ECQM1H472JZ	Polyester 4700pF		50V
C304	TCSZ35EFR33V	Tantalum 0.033μF		35V
C305	ECSF16E4R7ZE	Tantalum 47μF		16V
C306	ECSZ16EF4R7N	Tantalum 47μF		16V
C307	ECEA1CS100	Electrolytic 10μF		16V
C308	ECEA0JS330	Electrolytic 33μF		6.3V
C309	ECEA1CS221	Electrolytic 220μF		16V
C310	ECEA1AS102	Electrolytic 1000μF		10V
C311	ECQM1H333JZ	Polyester 0.033μF		50V
C312	ECEA1CS471	Electrolytic 470μF		16V
C423	ECEA1CS331	Electrolytic 330μF		16V
C430	ECQM1H153JZ	Polyester 0.015μF	J	50V
C441 ⚠	ECKD2H821KB9	Ceramic 820pF	K	500V
C442 ⚠	ECQM6153KZ	Polyester 0.015μF	K	600V
C444 ⚠	ECEA25W8R5Z	Electrolytic 8.5μF		25V
C445	ECEA1HS101	Electrolytic 10μF		50V
C460 ⚠	ECQE10473KZ	Polyester 0.047μF	K	1KV
C461 ⚠	ECEA1JS101	Electrolytic 100μF		63V
C463	ECEA2VS3R3Y	Electrolytic 3.3μF		350V
C465	ECEA350VR47	Electrolytic 0.47μF		350V
C491 ⚠	ECEA1CS102	Electrolytic 1000μF		16V
C493	ECQM1H472JZ	Polyester 4700pF	J	50V
C494	ECCD1H271J	Ceramic 270pF	J	50V
C496	ECEA0JS101	Electrolytic 100μF		6.3V
C497	ECCD1H221J2	Ceramic 220pF	J	50V
C602	ECKD2H102KB2	Ceramic 1000pF	K	500V
C705	ECEA1CS222	Electrolytic 2200μF		16V
RESISTORS				
R143	ERD25TJ470	Carbon 47Ω	J	¼W
R144	ERD25TJ470	Carbon 47Ω	J	¼W
R146	ERD25TJ820	Carbon 82Ω	J	¼W
R151	ERG2ANJ821	Metal Oxide 820Ω	J	2W
R161B	ERD25TJ102	Carbon 1KΩ	J	¼W

Ref. No.	Part No.	Description		
R170	ERD25TJ103	Carbon 10KΩ	J	¼W
R171	ERD25TJ103	Carbon 10KΩ	J	¼W
R172	ERD25TJ562	Carbon 5.6KΩ	J	¼W
R301	ERD25TJ392	Carbon 3.9KΩ	J	¼W
R302	ERD25TJ683	Carbon 68KΩ	J	¼W
R303 ⚠	ERD25FJ6R8	Carbon 6.8Ω	J	¼W
R304 ⚠	ERD25TJ1R1	Carbon 1.1Ω	J	¼W
R305	ERD25TJ823	Carbon 8.2KΩ	J	¼W
R306 ⚠	ERD25FJ6R8	Carbon 6.8Ω	J	¼W
R307	ERD25TJ4R7	Carbon 4.7Ω	J	¼W
R310	ERD25TJ153	Carbon 15KΩ	J	¼W
R423 ⚠	ERD25FJ680	Carbon 68Ω	J	¼W
R431	ERD25TJ222	Carbon 2.2KΩ	J	¼W
R432 ⚠	TRF2SJ100	Non Flame 10Ω	J	2W
R433	ERD25TJ471	Carbon 470Ω	J	¼W
R441 ⚠	ERD25FJ6R8	Carbon 6.8Ω	J	¼W
R442 ⚠	TRF2SKR47	Non Flame 0.47Ω	K	2W
R443 ⚠	ERD25FJ122	Carbon 1.2KΩ	J	¼W
R444	ERD25FJ122	Carbon 1.2KΩ	J	¼W
R447	ERG1ANJ681	Metal Oxide 680Ω	J	1W
R460 ⚠	ERD14FJ102	Carbon 1KΩ	J	¼W
R461 ⚠	ERD25FJ6R8	Carbon 6.8Ω	J	¼W
R465	ERD25TJ274	Carbon 270KΩ	J	¼W
R466	ERD25TJ333	Carbon 33KΩ	J	¼W
R468	ERD25TJ105	Carbon 1MΩ	J	¼W
R472	ERG1ANJ104	Metal Oxide 0.1μF	J	1W
R491	ERD25TJ273	Carbon 27KΩ	J	¼W
R492	ERD25TJ822	Carbon 8.2KΩ	J	¼W
R493	ERD25TJ682	Carbon 6.8KΩ	J	¼W
R494	ERD25TJ681	Carbon 680Ω	J	¼W
R495	ERD25TJ122	Carbon 1.2KΩ	J	¼W
R496	ERD25TJ103	Carbon 10KΩ	J	¼W
R601	ERD12FJ561	Carbon 560Ω	J	½W
R602 ⚠	ERD25FJ103	Carbon 10KΩ	J	¼W
R605 ⚠	ERD25FJ103	Carbon 10KΩ	J	¼W
R606 ⚠	ERD25FJ103	Carbon 10KΩ	J	¼W
R495	ERD25TJ103	Carbon 10KΩ	J	¼W

OTHER PARTS		
	TJS25640V	CRT Socket
SF1,3	TJC305-1	Fuse Holder
	TMK81516	CRT PWB. Cover
	TMM81434	Push Revet
	XBA1F20NU14	Fuse 2A

CONTROLS			
VR31	EVTS3AA00B15	Vert. Hold	100KΩB
VR32	EVTS3AA00B54	Vert. Height	50KΩB
VR33	EVTS3AA00B14	Vert. Lin.	10KΩB
VR64	EVT81US10B26	Focus Control	
VR67	EVLS3JA00B25	Sub. Bright	

Ref. No.	Part No.	Description
Model No. M-29001N/M-29004N TNP81896-22		
I.C		
IC31	AN5763	V-Osc. Amp. Output
IC41	AN5753	Sync.-Sep. Amp. H-Osc. Afc. Drive
TRANSISTORS		
Q10	2SC829C	Video Pre-Amp.
Q11	2SC829C	Video Pre-Amp.
Q12	2SC829C	Video Pre-Amp.
Q14	2SC1360ANC	Video Amp.
Q19	2SC828AR	Video Pre-Amp. Buf. (Q, R)
Q44	2SC940-1	Horiz. Output
DIODES		
D12	MA150	Pedestal Level
D13	TVSRD3R9EB2	Zener
D31	TVS10E1	Rectifier
D32	MA150	Vert. Blanking
D43A ⚠	TVSBB4A	Dumper
D43B ⚠	TVSBB4A	Dumper
D44 ⚠	TVS2DL15	Focus
D45	MA150	Horiz. Blanking
D46	TVSBB4	Diode
D47 ⚠	TVSS1R20	Diode
D51 ⚠	TVSBB4	OB Rectifier
COILS & TRANSFORMERS		
L121	TLT047-999	Peaking Coil 4.7μH
L122	TLP408	Choke Coil
L141	TLT047-999	Peaking Coil 4.7μH
L403 ⚠	TLH80710	Horiz. Width Coil
L404 ⚠	TLH80619	Horiz. Lin. Coil
L405	TLP408	Choke Coil
L430 ⚠	TLH80410	Horiz. Drive Trans.
R445	TLP408	Choke Coil
T401 ⚠	TLF80837	Flyback Trans.

CAPACITORS

C121	ECEA1CN470SE	Electrolytic	47μF		16V
C122	ECEA0JS470	Electrolytic	47μF		6.3V
C123	ECKD1H103PF2	Ceramic	0.01μF	$^{+100}_{-0}$%	50V
C124	ECEA1ES4R7	Electrolytic	4.7μF		25V
C125	ECEA1CS220	Electrolytic	22μF		16V
C126	ECCD1H220JC2	Ceramic	22pF	±5%	50V
C127	ECEA1CS101	Electrolytic	100μF		16V
C143	ECCD1H181JC	Ceramic	180pF	±5%	50V
C145	ECEA1JS100	Electrolytic	10μF		63V
C161	ECEA1ES4R7	Electrolytic	4.7μF		25V
C301	ECQM1H223JZ	Polyester	0.022μF	±5%	50V
C302	ECQM1H223JZ	Polyester	0.022μF	±5%	50V
C303	ECQM1H103JZ	Polyester	0.01μF	±5%	50V
C304	ECSZ35EFR33V	Tantalum	0.33μF		35V
C305	ECSZ16EF4R7N	Tantalum	4.7μF		16V
C306	ECSZ16EF4R7N	Tantalum	4.7μF		16V
C307	ECEA1CS100	Electrolytic	10μF		16V
C308	ECEA0JS330	Electrolytic	33μF		6.3V
C309	ECEA1CS221	Electrolytic	220μF		16V
C310	ECEA1AS102	Electrolytic	1000μF		10V
C311	ECQM1H333JZ	Polyester	0.033μF	±5%	50V
C312	ECEA1CS471	Electrolytic	470μF		16V
C401	ECQM1H183JZ	Polyester	0.018μF	±5%	50V
C402	ECQM1H153JZ	Polyester	0.015μF	±5%	50V
C403	ECQM1H103JZ	Polyester	0.01μF	±5%	50V
C404	ECEA1ES4R7	Electrolytic	4.7μF		25V
C405	ECQS1392JWT	Styrol	3900pF	±5%	100V
C406	ECQM1H102JZ	Polyester	1000pF	±5%	50V
C407	ECCD2H220K	Ceramic	22pF	±10%	500V
C423	ECEA1CS331	Electrolytic	330μF		16V
C430	ECQM1H153JZ	Polyester	0.015μF	±5%	50V
C441 ⚠	ECKD2H102KB2	Ceramic	1000pF	±10%	500V
C442 ⚠	ECQM4223KZ	Polyester	0.022μF	±10%	400V
C443 ⚠	ECQM4223KZ	Polyester	0.022μF	±10%	400V
C444 ⚠	ECEA25W12Z	Electrolytic	12μF		25V
C460 ⚠	ECQE6104KZ	Polyester	0.1μF	±10%	600V
C461 ⚠	ECEA1JS101	Electrolytic	100μF		63V
C463	ECEA2VS3R3Y	Electrolytic	3.3μF		350V
C465	ECEA2VSR47Y	Electrolytic	0.47μF		350V
C491 ⚠	ECEA1CS102	Electrolytic	1000μF		16V
C602	ECKD2H102KB2	Ceramic	1000pF	±10%	500V
C705	ECEA1CS222	Polyester	2200μF		16V

RESISTORS

R121	ERD25TJ820	Carbon	82Ω	±5%	¼W
R122	ERD25TJ821	Carbon	820Ω	±5%	¼W
R123	ERD25TJ820	Carbon	82Ω	±5%	¼W
R124	ERD25TJ821	Carbon	820Ω	±5%	¼W
R125	ERD25TJ102	Carbon	1KΩ	±5%	¼W
R126	ERD25TJ820	Carbon	82Ω	±5%	¼W
R127	ERD25TJ181	Carbon	180Ω	±5%	¼W
R128	ERD25TJ562	Carbon	5.6KΩ	±5%	¼W
R129	ERD25TJ122	Carbon	1.2KΩ	±5%	¼W
R131	ERD25TJ563	Carbon	56KΩ	±5%	¼W
R132	ERD25TJ332	Carbon	3.3KΩ	±5%	¼W
R133	ERD25TJ271	Carbon	270Ω	±5%	¼W
R143	ERD25TJ470	Carbon	47Ω	±5%	¼W
R144	ERD25TJ220	Carbon	22Ω	±5%	¼W
R146	ERD25TJ820	Carbon	82Ω	±5%	¼W
R151	ERG2ANJ821	Metal Oxide	820Ω	±5%	2W
R161A	ERD25TJ151	Carbon	150Ω	±5%	¼W
R173	ERD25TJ122	Carbon	1.2KΩ	±5%	¼W
R174 ⚠	ERD25TJ222	Carbon	2.2KΩ	±5%	¼W
R300	ERD25TJ153	Carbon	15KΩ	±5%	¼W
R301	ERD25TJ392	Carbon	3.9KΩ	±5%	¼W
R302	ERD25TJ683	Carbon	68KΩ	±5%	¼W
R303 ⚠	ERD25TJ6R8	Carbon	6.8Ω	±5%	¼W
R304 ⚠	ERD25FJ1R1	Carbon	1.1Ω	±5%	¼W
R305	ERD25TJ683	Carbon	68KΩ	±5%	¼W
R306 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5%	¼W
R307	ERD25TJ4R7	Carbon	4.7Ω	±5%	¼W
R308	ERD25TJ331	Carbon	330Ω	±5%	¼W
R309	ERD25TJ331	Carbon	330Ω	±5%	¼W
R310	ERD25TJ153	Carbon	15KΩ	±5%	¼W
R401	ERD25TJ333	Carbon	33KΩ	±5%	¼W
R402	ERD25TJ332	Carbon	3.3KΩ	±5%	¼W

Ref. No.	Part No.	Description		
R403	ERD25TJ273	Carbon	27KΩ	±5% ¼W
R404	ERD25TG2701	Carbon	2.7KΩ	±2% ¼W
R423 ⚠	ERD25FJ680	Carbon	68Ω	±5% ¼W
R432 ⚠	TRF2SJ100	Carbon	10Ω	±5% 2W
R441 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5% ¼W
R443 ⚠	ERD25FJ122	Carbon	1.2KΩ	±5% ¼W
R444	ERD25TJ122	Carbon	1.2KΩ	±5% ¼W
R447	ERG1ANJ681	Metal Oxide	680Ω	±5% 1W
R460 ⚠	ERD25FJ102	Carbon	1KΩ	±5% ¼W
R461 ⚠	ERD25FJ6R8	Carbon	6.8Ω	±5% ¼W
R465	ERD25TJ334	Carbon	330KΩ	±5% ¼W
R470	ERD25TJ102	Carbon	1KΩ	±5% ¼W
R472	ERG1ANJ104	Metal Oxide	100KΩ	±5% ½W
R601	ERC12GJ561	Solid	560Ω	±5% ½W
R602 ⚠	ERD25FJ103	Carbon	10KΩ	±5% ¼W
R605 ⚠	ERD25FJ103	Carbon	10KΩ	±5% ¼W
R606 ⚠	ERD25FJ103	Carbon	10KΩ	±5% ¼W

CONTROLS

VR11	EVTS3MA00B52	Sub. Contrast	500ΩB
VR12	EVNK4AA00B13	Pedestal Level	1KΩB
VR31	EVTS3AA00B15	Vert.-Hold	100KΩB
VR32	EVTS3AA00B54	Vert.-Height	50KΩB
VR33	EVTS3AA00B14	Vert.-Lin.	10KΩB
VR41	EVTS3MA00B52	Horiz.-Hold	500ΩB
VR64	EVM81U10KB26	Focus	2MΩB
VR67	EVLS3JA00B25	Sub. Bright	200KΩB

OTHER PARTS

SF1,3	TJS305-1	Fuse Holder
	TJS25640V	CRT Socket
	TMK81516	CRT Cover
	TMM81434	Revet
⚠	XBA1F20NU14	Fuse

Model No. M-12021NB/M-12021PB TNP81894-34

I.C

IC31	AN5763	V-Osc. Amp. Output
IC41	AN5752	I.C
IC42	TVSMPD4011C	Phase Control

TRANSISTORS

Q14	2SC1360ANC	Video Amp.
Q18	2SC828AR	Transistor (Q, R)
Q17	2SC828AR	Transistor (Q, R)
Q44	2SC901BN	Horiz. Output

DIODES

D31	TVS10E1	Rectifier
D43A ⚠	TVSBB4A	Dumper
D43B ⚠	TVSBB4A	Dumper
D44 ⚠	TVS2DL15	Focus
D47 ⚠	TVSS1R20	Video Rectifier
D49A ⚠	TVSBB2A	Boost
D49B ⚠	TVSBB2A	Boost
D51 ⚠	TVSBB4A	Rectifier

COILS & TRANSFORMERS

L141	TLT047-999	Peaking Coil 0.47μH
L403 ⚠	TLH80704	Horiz. Width Coil
L404 ⚠	TLH80608	Horiz. Lin. Coil
L405	TLP408	Choke Coil
L430 ⚠	TLH80410	Horiz. Drive Trans.
T401 ⚠	TLF80838	Flyback Trans.
R445	TLP408	Choke Coil

CAPACITORS

C143	ECCD1H221J	Ceramic	220pF ±5%	50V
C145	ECEA1JS100	Electrolytic	10μF	63V
C302	ECQM1H103JZ	Polyester	0.01μF ±5%	50V
C303	ECQM1H472JZ	Polyester	4700pF ±5%	50V
C304	TCSZ35EFR33V	Tantalum	0.033μF	35V
C305	ECSF16E4R7ZE	Tantalum	4.7μF	16V
C306	ECSZ16EF4R7N	Tantalum	4.7μF	16V
C307	ECEA1CS100	Electrolytic	10μF	16V
C308	ECEA0JS330	Electrolytic	33μF	6.3V
C309	ECEA1CS221	Electrolytic	220μF	16V
C310	ECEA1AS102	Electrolytic	1000μF	10V
C311	ECQM1H333JZ	Polyester	0.033μF ±5%	50V
C312	ECEA1CS471	Electrolytic	470μF	16V
C401	ECQM1H183JZ	Polyester	0.018μF ±5%	50V
C402	ECQM1H153JZ	Polyester	0.015μF ±5%	50V
C403	ECQM1H103JZ	Polyester	0.01μF ±5%	50V
C404	ECEA1ES4R7	Electrolytic	4.7μF	25V
C405	ECQS1392JWT	Styrol	2.2μF ±5%	100V
C406	ECQM1H102JZ	Polyester	1000pF ±5%	50V
C423	ECEA1CS331	Electrolytic	330μF	16V
C430	ECQM1H153JZ	Polyester	0.015μF ±5%	50V
C441 ⚠	ECKD2H821KB9	Ceramic	820pF ±10%	500V
C442 ⚠	ECQM6153KZ	Polyester	0.015μF ±10%	600V
C444 ⚠	ECEA25W8R5Z	Electrolytic	8.5μF	25V
C445	ECEA1HS101	Electrolytic	10μF	50V
C460 ⚠	ECQE10473KZ	Polyester	0.047μF ±10%	1KV
C461 ⚠	ECEA1JS101	Electrolytic	100μF	63V
C463	ECEA2VS3R3Y	Electrolytic	3.3μF	350V
C465	ECEA350VR47	Electrolytic	0.47μF	350V
C491 ⚠	ECEA1CS102	Electrolytic	1000μF	16V
C492	ECQM1H102JZ	Electrolytic	1000pF ±5%	50V
C496	ECEA0JS101	Electrolytic	100μF	6.3V
C497	ECCD1H121J	Ceramic	120pF ±5%	50V
C602	ECKD2H102KB2	Ceramic	1000pF ±10%	500V
C705	ECEA1CS222	Electrolytic	2200μF	16V

RESISTORS

R143	ERD25FJ470K	Carbon	47Ω	±5% ¼W
R144	ERD25FJ470K	Carbon	47Ω	±5% ¼W
R146	ERD25FJ820K	Carbon	82Ω	±5% ¼W
R151	ERG2ANJ821	Metal Oxide	820Ω	±5% 2W
R170	ERD25FJ103K	Carbon	10KΩ	±5% ¼W
R171	ERD25FJ103K	Carbon	10KΩ	±5% ¼W
R172	ERD25FJ562K	Carbon	5.6KΩ	±5% ¼W

Ref. No.	Part No.	Description			
R175	ERD25FJ472K	Carbon	4.7KΩ	±5%	¼W
R176	ERD25FJ103K	Carbon	10KΩ	±5%	¼W
R177	ERD25FJ472K	Carbon	4.7KΩ	±5%	¼W
R301	ERD25FJ392K	Carbon	3.9KΩ	±5%	¼W
R302	ERD25FJ683K	Carbon	68KΩ	±5%	¼W
R303 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	±5%	¼W
R304 ⚠	ERD25FJ1R1K	Carbon	1.1Ω	±5%	¼W
R305	ERD25FJ823K	Carbon	8.2KΩ	±5%	¼W
R306 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	±5%	¼W
R307	ERD25FJ4R7K	Carbon	4.7Ω	±5%	¼W
R310	ERD25FJ153K	Carbon	15KΩ	±5%	¼W
R313	ERD25FJ561K	Carbon	560Ω	±5%	¼W
R401	ERD25FJ333K	Carbon	33KΩ	±5%	¼W
R402	ERD25FJ332K	Carbon	3.3KΩ	±5%	¼W
R403	ERD25FJ273K	Carbon	27KΩ	±5%	¼W
R404	ERO25CKG2701	Metal	2.7KΩ	±2%	¼W
R423 ⚠	ERD25FJ680K	Carbon	68Ω	±5%	¼W
R432 ⚠	TRF2SJ100	Non Flame	10Ω	±5%	2W
R441 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	±5%	¼W
R442 ⚠	TRF2SKR47	Non Flame	0.47Ω	±5%	2W
R443 ⚠	ERD25FJ122K	Carbon	1.2KΩ	±5%	¼W
R444	ERD25FJ122K	Carbon	1.2KΩ	±5%	¼W
R447	ERG1ANJ681	Metal Oxide	680Ω	±5%	1W
R460 ⚠	ERD25FJ102K	Carbon	1KΩ	±5%	¼W
R461 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	±5%	¼W
R465	ERD25FJ274K	Carbon	270KΩ	±5%	¼W
R466	ERD25FJ333K	Carbon	33KΩ	±5%	¼W
R468	ERD25FJ105K	Carbon	1MΩ	±5%	¼W
R472	ERG1ANJ104	Metal Oxide	0.1μF	±5%	1W
R493	ERD25FJ682K	Carbon	6.8KΩ	±5%	¼W
R494	ERD25FJ681K	Carbon	680Ω	±5%	¼W
R495	ERD25FJ122K	Carbon	1.2KΩ	±5%	¼W
R497	ERD25FJ472K	Carbon	4.7KΩ	±5%	¼W
R498	ERD25FJ272K	Carbon	2.7KΩ	±5%	¼W
R601	ERD25FJ561K	Carbon	560Ω	±5%	¼W
R602 ⚠	ERD25FJ103K	Carbon	10KΩ	±5%	¼W
R605 ⚠	ERD25FJ103K	Carbon	10KΩ	±5%	¼W
R606 ⚠	ERD25FJ103K	Carbon	10KΩ	±5%	¼W

OTHER PARTS

	TJS25640V	CRT Socket	
SF1,3	TJC305-1	Fuse Holder	
	TMK81516	CRT PWB. Cover	
	TMM81434	Push Revet	
⚠	XBA1F20NU14	Fuse	2A

CONTROLS

VR31	EVTS3AA00B15	Vert. Hold	100KΩB
VR32	EVTS3AA00B54	Vert. Height	50KΩB
VR33	EVTS3AA00B14	Vert. Lin.	10KΩB
VR41	EVTS3MA00B13	Horiz. Hold	1KΩB
VR42	EVNK4BA00B24	H.P.C	20KΩB
VR64	EVT81US10B26	Focus Control	
VR67	EVTS3MA00B25	Sub. Bright	

Ref. No.	Part No.	Description

Model No. M-12041NB
TNP81894-39 MAIN P.C. BOARD

I.C

IC31	AN5763	I.C
IC41	AN5753	I.C
IC42	TVSUPD4011BC	I.C

TRANSISTORS

Q14	2SC1360ANC	Transistor
Q17	2SC828AR	Transistor
Q18	2SC828AR	Transistor
Q44	2SC901BN	Transistor

DIODES

D31	TVS10E1	Diode
D43A ⚠	TVSBB4A	Diode
D43B ⚠	TVSBB4A	Diode
D44 ⚠	TVS2DL15	Diode
D46	TVSBB4	Diode
D47 ⚠	TVSS1R20	Diode
D49A ⚠	TVSBB2A	Diode
D49B ⚠	TVSBB2A	Diode
D51 ⚠	TVSBB4	Diode

COILS & TRANSFORMERS

L141	TLT047-999	Peaking Coil	0.47μH
L403 ⚠	TLH80725	Width Coil	
L404 ⚠	TLH80624	H. Lin. Coil	
L405	TLP408	Choke Coil	
L430 ⚠	TLH80410	H. Drive Trans.	
T401 ⚠	TLF80845	Flyback Trans.	

RESISTORS

R143	ERD25FJ470K	Carbon	47Ω	J	¼W
R144	ERD25FJ220K	Carbon	22Ω	J	¼W
R146	ERD25FJ820K	Carbon	82Ω	J	¼W
R151	ERG2ANJ821	Metal Oxide	820Ω	J	2W
R170	ERD25FJ103K	Carbon	10KΩ	J	¼W
R171	ERD25FJ103K	Carbon	10KΩ	J	¼W
R172	ERD25FJ562K	Carbon	5.6KΩ	J	¼W
R175	ERD25FJ472K	Carbon	4.7KΩ	J	¼W
R176	ERD25FJ103K	Carbon	10KΩ	J	¼W
R177	ERD25FJ472K	Carbon	4.7KΩ	J	¼W
R301	ERD25FJ392K	Carbon	3.9KΩ	J	¼W
R302	ERD25FJ683K	Carbon	68KΩ	J	¼W
R303 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R304 ⚠	ERD25FJ1R1K	Carbon	1.1Ω	J	¼W
R305	ERD25FJ683K	Carbon	68KΩ	J	¼W
R306 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R307	ERD25FJ4R7K	Carbon	4.7Ω	J	¼W
R310	ERD25FJ153K	Carbon	15KΩ	J	¼W
R313	ERD25FJ561K	Carbon	56Ω	J	¼W
R401	ERD25FJ333K	Carbon	33KΩ	J	¼W
R402	ERD25FJ332K	Carbon	3.3KΩ	J	¼W
R403	ERD25FJ273K	Carbon	27KΩ	J	¼W
R404	ERD25FJ222K	Carbon	2.2KΩ	J	¼W

Ref. No.	Part No.	Description			
R423 ⚠	ERD25FJ680K	Carbon	68Ω	J	¼W
R432 ⚠	ERF2AJ100	Non Flame	10Ω	J	2W
R441 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R442 ⚠	ERF2AJR47	Non Flame	0.47Ω	J	2W
R443 ⚠	ERD25FJ122K	Carbon	1.2KΩ	J	¼W
R444	ERD25FJ122K	Carbon	1.2KΩ	J	¼W
R445	TLP408	Hoke Coil			
R447	ERG1ANJ681	Metal Oxide	680Ω	J	1W
R460 ⚠	ERD25FJ102K	Carbon	1KΩ	J	¼W
R461 ⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R465	ERD25FJ274K	Carbon	270KΩ	J	¼W
R466	ERD25FJ333K	Carbon	33KΩ	J	¼W
R468	ERD25FJ105K	Carbon	1MΩ	J	¼W
R472	ERG1ANJ104	Metal	100KΩ	J	1W
R493	ERD25FJ682K	Carbon	6.8KΩ	J	¼W
R494	ERD25FJ681K	Carbon	680Ω	J	¼W
R495	ERD25FJ122K	Carbon	1.2KΩ	J	¼W
R497	ERD25FJ472K	Carbon	4.7KΩ	J	¼W
R498	ERD25FJ272K	Carbon	2.7KΩ	J	¼W
R601	ERC12GJ561	Solid	560Ω	J	½W
R602 ⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
R605 ⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
R606 ⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
J403	ERD25FJ271K	Carbon	270Ω	J	¼W

CAPACITORS

C143	ECCD1H221	Ceramic	180pF	J	50V
C145	ECEA1JS100	Electrolytic	10μF		63V
C302	ECQM1H103JZ	Polyester	0.01μF	J	50V
C303	ECQM1H472JZ	Polyester	4700pF	J	50V
C304	ECSF35ER33V	Tantalum	0.33μF		35V
C305	ECSF16E4R7Y	Tantalum	4.7μF		16V
C306	ECSF16E4R7Y	Tantalum	4.7μF		16V
C307	ECEA1CS100	Electrolytic	10μF		16V
C308	ECEA0JS330	Electrolytic	33μF		6.3V
C309	ECEA1CS221	Electrolytic	220μF		16V
C310	ECEA1AS102	Electrolytic	1000μF		10V
C311	ECQM1H333JZ	Polyester	0.033μF	J	50V
C312	ECEA1CS471	Electrolytic	470μF		16V
C401	ECQM1H183JZ	Polyester	0.018μF	J	50V
C402	ECQM1H153JZ	Polyester	0.015μF	J	50V
C403	ECQM1H103JZ	Polyester	0.01μF	J	50V
C404	ECEA1ES4R7	Electrolytic	4.7μF		25V
C405	ECQS1322JWT	Styrol	3200pF	J	100V
C406	ECQM1H102JZ	Polyester	1000pF	J	50V
C423	ECEA1CS331	Electrolytic	330μF		16V
C430	ECQM1H153JZ	Polyester	0.015μF	J	50V
C441	ECKD2H821KB9	Ceramic	820pF	K	500V
C442	ECQM6153KZ	Polyester	0.015μF	K	600V
C444	ECEA35W4R7Z	Electrolytic	4.7μF		35V
C445	ECEA50V100Y	Electrolytic	10μF		50V
C460	ECQE10104KZ	Polyester	0.1μF	K	1KV
C461	ECEA1JS101	Electrolytic	100μF		63V
C463	ECEA2VS3R3Y	Electrolytic	3.3μF		350V
C465	ECEA2VSR47Y	Electrolytic	0.47μF		350V
C491	ECEA1CS102	Electrolytic	1000μF		16V

Ref. No.	Part No.	Description			
C492	ECQM1H102JZ	Polyester	1000pF	J	50V
C496	ECEA0JS101	Electrolytic	100μF		6.3V
C497	ECCD1H121J	Ceramic	120pF	J	50V
C602	ECKD2H102KB2	Ceramic	1000pF	K	500V
C705	ECEA1CS222	Electrolytic	2200μF		16V

OTHER PARTS

	TJS25640V	CRT Socket	
	TMK81516	CRT P.C Board Cover	
	TMM81434	Rivet	
⚠	XBA1F20NU14	Fuse	2A
SF1,3	TJC305-1	Fuse Holder	

CONTROLS

VR31	EVTS3AA00B15	V. Hold Control	100KΩB
VR32	EVTS3MA00B54	Height Control	50KΩB
VR33	EVTS3MA00B14	V. Lin. Control	10KΩB
VR41	EVTS3MA00B13	H. Hold Control	1KΩB
VR42	EVNK4AA00B24	HPC Control	20KΩB
VR64	EVT81US10B26	Focus Control	2MΩB
VR67	EVTS3MA00B25	Sub. Bright Control	200KΩB

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CODE FTD82020196-1

Service Manual

Supplement

CRT Data Display

MODEL M-12021PB
MODEL M-12021NB

This Supplimental Copy is listed Only the Different Portion From

M-12004NA/NB

The Difference are:

	M-12021PB	M-12021NB	M-12004NA/NB
CRT. Phosphor	P31 (Green)	P31 (Green)	P4 (White)
CRT. Sur-face	Polish	Nonglare	Nonglare
Horizontal OSC Circuit	Available		N / A

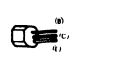
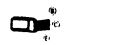
All other specifications are same as that of the basic models M-12004NA/NB.

Panasonic®

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

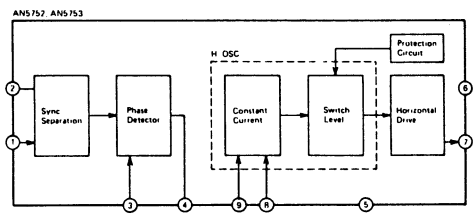
Supplemental Parts List.

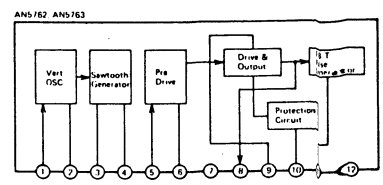
Ref. No.	Part No.	Description			
⚠	310JLB31J	CRT. (Model. M-12021PB)			
⚠	310KRB31N	CRT. (Model. M-12021NB)			
HORIZONTAL OSC CIRCUIT PART					
I. C.					
IC41	AN5752 or AN5753	H. OSC. Drive			
TRANSISTORS					
Q18	2SC828AR or 2SC945PQ	H. Sync. AMP			
RESISTORS					
R401	ERD25TJ333	Carbon	33KΩ	±5%	¼ %
R402	ERD25TJ332	Carbon	3.3KΩ	±5%	¼ %
R403	ERD25TJ273	Carbon	27KΩ	±5%	¼ %
R404	ERD25TJ2701	Carbon	2.7KΩ	±2%	¼ %
R497	ERD25TJ472	Carbon	4.7KΩ	±5%	¼ %
R498	ERD25TJ103	Carbon	10KΩ	±5%	¼ %
R175	ERD25TJ472	Carbon	4.7KΩ	±5%	¼ %
R176	ERD25TJ103	Carbon	10KΩ	±5%	¼ %
R177	ERD25TJ472	Carbon	4.7KΩ	±5%	¼ %
CAPACITORS					
C401	ECQM1H183JZ	Polyester	0.018μF	±5%	50V
C402	ECQM1H153JZ	Polyester	0.015μF	±5%	50V
C403	ECQM1H103JZ	Polyester	0.01μF	±5%	50V
C404	ECEA1ES4R7	Electrolytic	4.7μF		25V
C405	ECQS1392JWT	Styrol	3900PF	±5%	100V
C406	ECQM1H102JZ	Polyester	1000PF	±5%	50V
C492	ECCD1H331T	Polyester	330PF	±5%	50V
C497	ECCD1H121J	Ceramic	120PF	±5%	50V
CONTROLS					
VR41	EVTSMA0013	Horiz. HOLD	1KΩB		
VR42	EVNK4BA00B24	H.P.C	20KΩB		

TRANSISTOR BASE INFORMATION	
LOCATION	PARTS NAME
	2SC828 2SC829C 2SC945 2SC1318
	2SC1360ANC
	2SC940 2SC9018N
	AN5753 AN5752
	AN5762 AN5763 AN5763(N)
	MPD4011C TC4011BP MN4011B

IMPORTANT SAFETY NOTICE

The component identified by shading and the international symbol ⚠ on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for those critical components.





NOTE

1. RESISTOR
   All resistors are carbon 1/4W resistor, unless otherwise noted the following marks.
   Unit of resistance is OHM (Ω). (K=1,000, M=1,000,000)
   ⚠ : Solid resistor
   (F) : Non Flame
2. CAPACITOR
   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks.
   Unit of capacitance is μF, unless otherwise noted.
   (M) : Polyester (S) : Polystylene capacitor
   ⊣⊢ : Electrolytic capacitor (T) : Tantalum
3. COIL
   Unit of inductance is μH.
4. VOLTAGE MEASUREMENT
   a. Voltage is measured by a digital meter with DC 10MΩ OHM, receiving normal signal.
   b. Use each measurement voltage for reference.

SCHEMATIC DIAGRAM FOR MODELS M-12021PB/M-12021NB